SPECIFICATION CHANGE NOTICE

Date Prepared: May 17, 2000

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11. Configuration Item Nomenclature	12. Effectivity
International Ground System Specification	N/A

THIS NOTICE INFORMS RECIPIENTS THAT THE DOCUMENT IDENTIFIED BY THE NUMBER (AND REVISION LETTER) SHOWN IN BLOCK 4 HAS BEEN CHANGED. THE PAGES CHANGED BY THIS SCN BEING THOSE FURNISHED HEREWITH AND CARRYING THE SAME DATE AS THIS SCN. THE PAGES OF THE PAGE NUMBERS AND DATES LISTED BELOW IN THE SUMMARY OF CHANGED PAGES COMBINED WITH NON-LISTED PAGES OF THE ORIGINAL ISSUE OF THE REVISION SHOWN IN BLOCK 4 CONSTITUTE THE CURRENT VERSION OF THIS SPECIFICATION.

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	F–169 – F–172		A	
	Order of SCN Incorporation SCN 001, 002, 004, 007, 005, 006, 008			

16. Technical Concurrence

_____ _____

Date

* "S" indicates supersedes earlier page. "A" indicates added page.

Form Date: 8/12/94

International Ground System Specification Document

International Space Station Program

Incorporates SCN 008

April 26, 1996

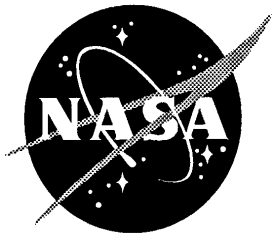
Russian Space Agency

Canadian Space Agency

Agence spatiale canadienne

agenzia spaziale italiana
(Italian Space Agency)

National Aeronautics and Space Administration
International Space Station Program
Johnson Space Center
Houston, Texas



REVISION AND HISTORY PAGE

REV.	DESCRIPTION	PUB. DATE
–	Initial Release per SSCD 000319, EFF. 09–06–96	09–30–96
	SCN 001 per SSCD 000315, EFF. 11–04–96	11–14–96
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	SCN 005 per SSCD 001421, EFF. 06–15–99	08–03–99
	SCN 006 per SSCD 001571R1, EFF. 08–20–99	04–11–00
	SCN 003 was initiated by Directive 000537 and has been superseded by Directive 000537 Revision 1	
	SCN 008 authorized update per Directive 000537 Revision 1 as amended by Directive 000537 Revision 2 EFF. 02–01–00, Directive 001756 EFF. 03–07–00, and Directive 001757 EFF. 02–28–00.	07–27–00

STATE VECTOR: The state vector is the instantaneous position and velocity of the Space Station related to a specified frame of reference.

STRUCTURE: For the purpose of failure tolerance requirements, the following types of systems/equipment are considered structure: primary structure; secondary structure; pressure vessel structure; micrometeoroid/orbital debris protection; fluid line structure and fittings including heat exchangers; radiation shielding; and cabling including connectors.

TASK TRAINING: Task training is the lowest level of training that performance can be evaluated by a single individual supporting individual Space Station system functions and payloads.

TELEMETRY: Component (ORU, system, etc.) health or status data delivered to the ground from the on–orbit vehicle. Telemetry is down–link only. Telemetry is not uplinked.

TIME TO CRITICALITY: The time between the occurrence of a failure, event or condition and the subsequent occurrence of a hazard or other undesired outcome. Times to criticality will be established by engineering or operational analysis.

USER PAYLOAD: Equipment designed and developed for the purpose of performing research onboard the on–orbit Space Station that is not considered part of the Space Station system.

6.2 Abbreviations and acronyms.

#	Number
%	Percent
A/G	Air–to–Ground
AAC	Aft Access Closure
AIS	Automated Information System
AIT	Analysis and Integration Team
AOS	Acquisition of Signal
APM	Attached Pressurized Module
APMC	Attached Pressurized Module Center
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ASI	Agenzia Spaziale Italiana (Italian Space Agency)
C&DH	Command and Data Handling
C&T	Communications and Tracking
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CCC	Consolidated Control Center
CCTV	Closed Circuit Television
CG	Center of Gravity
CGS	Canadian Ground Segment
CHeCS	Crew Health Care System
CI	Contract Item
CI/EI	Configuration Item/End Item
CM	Configuration Management
CMD	Command
	SCN 007
CMILP	Consolidated Maintenance, Inventory And Logistics Planning
CO2	Carbon Dioxide
COTS	Commercial Off The Shelf
CPS	Consolidated Planning System
CRV	Crew Return Vehicle
	SCN 008
CSA	Canadian Space Agency
CSCI	Computer Software Configuration Item
CSRD	Columbus System Requirements Document
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DAM	Diagnostic Acceptability Measure
DRT	Diagnostic Rhyme Test
DV	Delta Velocity
EEE	Electrical, Electronic, and Electromechanical
EMC	Electromagnetic Compatibility
EMR	Electromagnetic Radiation
ESA	European Space Agency
EU	Engineering Unit

EVA	Extravehicular Activity
EVR	Extravehicular Robotics
FCR	Flight Control Room
FDIR	Fault Detection, Isolation and Recovery
FDPA	Flight Dynamics Planning And Analysis
FGB	Functional Cargo Block
FMEA	Failure Mode Effects Analysis
GFE	Government Furnished Equipment
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GLSF	General Lab Support Facility
GN&C	Guidance Navigation and Control
GSE	Ground Support Equipment
GSP	Ground Support Personnel
H/W	Hardware
HDBK	Handbook
Hg	Mercury
HOSC	Huntsville Operational Support Center
HSG	Houston Support Group
HSR	Houston Support Room
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IAW	In accordance with
ICD	Interface Control Document
IDD	Interface Definition Document
IMARS	ISS MOD Avionics Reconfiguration Subsystem
	SCN 008
IMS	Inventory Management System
IMV	Intermodule Ventilation
in	inches
in	inch
In.	Inch
IOP	Increment Operations Plan
IP	International Partners
IPCL	Instrumentation Program and Commands List
IPS	Integrated Planning System
IRD	Interface Requirements Document
IRI	International Reference Ionosphere
ISPR	International Standard Payload Rack
ISS	International Space Station
ISSA	International Space Station Alpha
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ITS	Integrated Truss Segment
IVA	Intravehicular Activity

JEM	Japanese Experiment Module
JPDRD	Joint Program Definition and Requirements Document
JSC	Johnson Space Center
JSCM	Johnson Space Center Manual
k	kilo
K	Kelvin
kbps	Kilo bites per second
Kg	Kilogram
KSC	Kennedy Space Center
Ku–Band	15.250 to 17.250 Gigahertz
lbs	pounds
lbf	pounds force
Lbm	pounds mass
LOS	Loss of Signal
LRU	Line Replaceable Unit
LSE	Launch Support Equipment
m	meters
m	milli
m	meter
MBF	Mission Build Facility
Mbps	Mega bits per second
MCC–M	Mission Control Center–Moscow
MDM	Multiplexer Demultiplexer
MDS	Meteoroid Debris Shield
MIL	Military
MMD	MSS Maintenance Depot
MOD	Mission Operations Directorate
MPE	Maximum Permissible Exposure
MPLM	Mini–Pressurized Logistics Module
MPSR	Multi–Purpose Support Room
MRCS	MSS Robot Control Station
MRMDF	Multiple Remote Manipulator Development Facility
MSC	Mobile Servicing Centre
MSFC	Marshall Space Flight Center
MSS	Mobile Servicing System
MTSC	MPLM Technical Support Center
N	Newtons
N/A	Not Applicable
NA	Not Applicable
NASA	National Aeronautics and Space Administration
NASDA	National Space Development Agency of Japan
NBL	Neutral Buoyancy Laboratory

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NHB	NASA Handbook
NSTS	National Space Transportation System
NTSC	National Television Systems Committee
OPHX	Orbiter Payload Heat Exchanger
ORU	Orbital Replacement Unit
OSTP	On–Board Short Term Plan
PAO	Public Affairs Office
PCS	Portable Computer System
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PDAC	Procedures Development and Control
PDL	Payload Data Library
	SCN 007
PDSS	Payload Data Services System
PHC	Permanent Human Capability
PI	Principal Investigator
	SCN 007
PICF	Payload Integration and Checkout Facility
PIDS	Prime Item Development Specification
PIM	Payload Information Management Planning Information Management
POIC	Payload Operations Integration Center
POIF	Payload Operations Integration Facility
	SCN 007
	SCN 008
PPS	Payload Planning System
psia	pounds per square inch absolute
PSIV	Payload Software Integration and Verification
PTC	Payload Training Center
PTT	Part Task Trainer
Rev	Revision
RGS	Russian Ground Segment
RMA	Reliability, Maintainability, and Availability
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ROS	Russian Orbital Segment
RRCG	Russian Regional Control Group
	SCN 008
RS	Russian Segment
RSA	Russian Space Agency
RSGF	Rigidized Sensing Grapple Fixture
RUPSM	Resource Utilization, Planning And Systems Model
S/W	Software
S–Band	1550 to 5200 Megahertz
	SCN 007
Sensitive	

SES	System Engineering Simulator
SODF	Systems Operations Data File
SPDM	Special Purpose Dextrous Manipulator
SRMS	Shuttle Remote Manipulator System
SSCC	Space Station Control Center
SSI	Space Station Integration
SSIPC	Space Station Integrated Promotion Center
	SCN 007
SSIPC	Space Station Integration and Promotion Center
SSMB	Space Station Manned Base
SSMTF	Space Station Mock–up Training Facility
SSP	Space Station Program
SSRMS	Space Station Remote Manipulator System
SSTF	Space Station Verification and Training Facility
STD	Standard
STP	Short Term Plan
SVF	Software Verification Facility
TBD	To Be Determined
TCATS	Trajectory, Command, Analysis and Timeline System
TDRS	Tracking and Data Relay Satellites
TDRSS	Tracking and Data Relay Satellite Systems
TLM	Telemetry
TSC	Telescience Support Center
	SCN 007
TV	Television
UDFR	User Detailed Functional Requirements
UL	Underwriters Laboratory
UOF	User Operations Facility
US	United States
USGS	United States Ground Segment
USOC	United States Operations Center
USOS	United States On–Orbit Segment
Vdc	Volts direct current
Vol.	Volume
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WETF	Weightless Environment Training Facility
WSC	White Sands Complex
	SCN 007

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TABLES

FIGURES

A3.1.1.1 CGS description.

The CGS provides facilities and equipment required to support the on–orbit portions of the MSS and Canadian payloads. This includes the ability to receive data from and receive video from the on–orbit portions of MSS and the Canadian payloads.

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A3.1.2 Missions.

A3.1.3 Threat

NA

A3.1.4 System diagrams.

The MSS functional diagram is shown in Figure A–2.

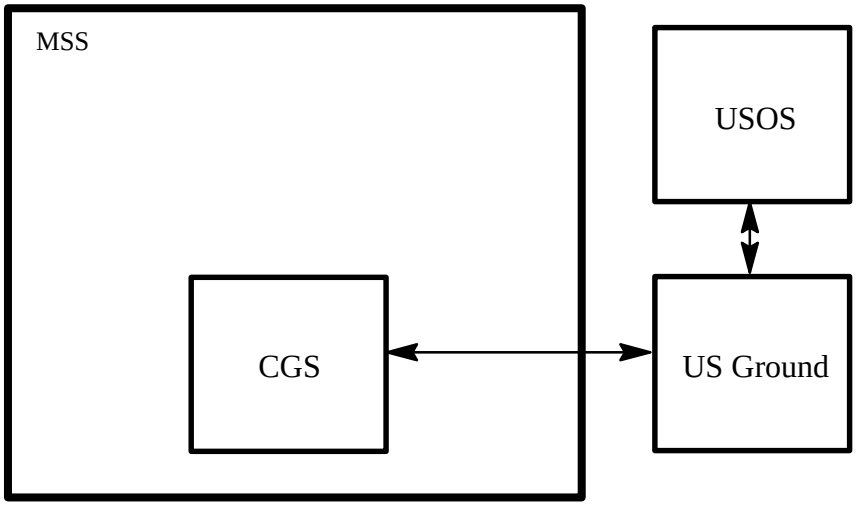

FIGURE A–2. MSS system diagram

A3.1.5 Interface requirements.

A3.1.5.1 External interfaces.

The MSS external interfaces are shown in Figure A–3 and described in the following paragraphs.

A3.1.5.1.1 US Ground Segment external interface description.

The Canadian Ground Segment is a part of the MSS. The CGS provides facilities and equipment required to support the operation of the on–orbit portions of the MSS and Canadian payloads.

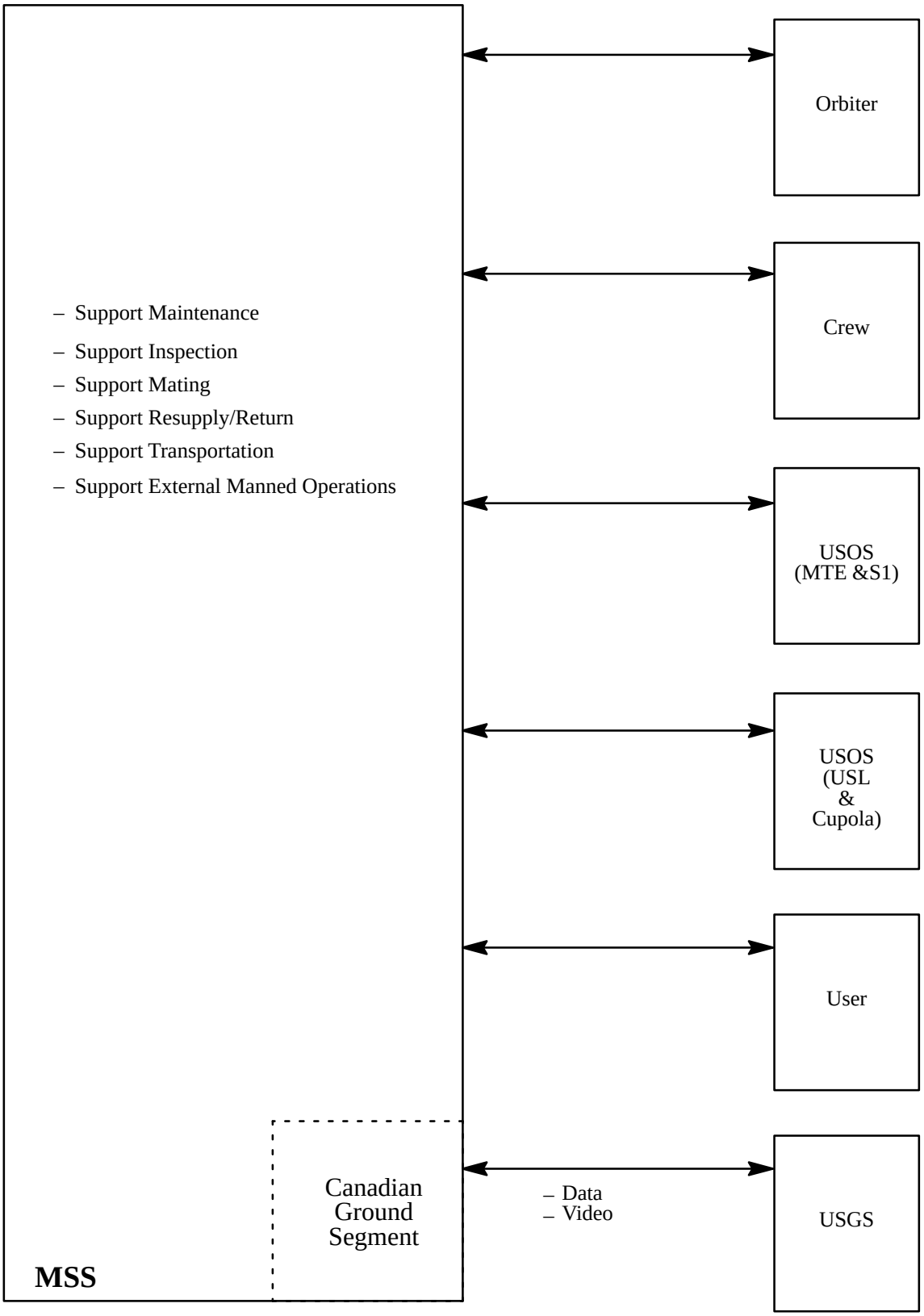

FIGURE A–3. MSS external interfaces

This includes the ability to receive data from and receive video from the on–orbit portions of
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MSS and the Canadian payloads. The detailed requirements for the physical and functional interfaces between the MSS CGS and the US Ground Segment (USGS) are defined as specified in SSP 45004**.**

A3.1.5.2 Internal interfaces.

A3.1.5.2.1 Canadian Ground Support internal interfaces description.

The Canadian Ground Support does not have interfaces with any other part of MSS.

A3.2 Characteristics

A3.2.1 Performance characteristics.

A3.2.1.1 State: Perform mission – habitable.

A3.2.1.1.1 Mode: Standard – habitable.

A3.2.1.1.1.1 Capability: Isolate to recovery level.

A3.2.1.1.1.2 Capability: Space Station system performance analysis.

Deleted.

A3.2.1.1.1.3 Capability: Support on–orbit operations.

Deleted.

A3.2.1.1.1.4 Capability: Provide data for uplink.

The purpose of the capability is for the CGS to collect and transmit data intended for uplink to the on–orbit portions of MSS. The CGS shall transmit data to the US Ground Segment (USGS) in accordance with SSP 45004.

A3.2.1.1.1.5 Capability: Support downlinked data.

The purpose of this capability is for the CGS to receive, process, and display downlinked MSS data received from the USGS. The CGS shall receive data from the USGS in accordance with SSP 45004.

A3.2.1.2 State: Support mission.

A3.2.1.2.1 Mode: Personnel preparation.

The personnel preparation mode consists of the functions required to ensure ground personnel and on–orbit crew working knowledge of the systems they will operate and maintain. This mode will begin when crew members start training for the activities associated with a specific increment, and ends when an appropriate level of proficiency for these activities has been demonstrated. This mode consists of the capabilities as shown in Table A–I and the following unique capability:

This mode consists of the functions required to ensure a working knowledge of system operations, payload operations, and maintenance operations, as appropriate for crew, ground processing, ground maintenance, controllers, and instructor personnel. This mode begins upon assignment of personnel to the Space Station program and includes both increment independent and increment specific preparation.

TABLE A–I. Mode/capability applicability matrix

Capability	Mode																		
	Standard–Habitable	Reboost – Habitable	Maneuver – Habitable	Microgravity – Habitable	Survival – Habitable	Proximity – Habitable	Assured safe crew return	External operations – Habitable	Standard – Untended	Reboost – Untended	Maneuver – Untended	Microgravity – Untended	Survival – Untended	Proximity – Untended	External operations – Untended	Ground processing	Operations planning	Reconfiguration preparation	Personnel Preparation
Control atmospheric pressure	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
Condition atmosphere	*	*	*	*	*	*	*	*	*	*	*	*		*	*				
Light station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
Respond to loss of function	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
Control station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
Support crew control interface	*	*	*	*	*	*	*	*											
Monitor system status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
Respond to emergency conditions	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
Support user payloads	*	*	*	*		*	*	*	*	*	*	*		*	*				
Perform ground mission operations	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
Provide electrical power	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
Maintain thermal conditioning	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
Maintain time reference	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
Support flight crew	*	*	*	*	*	*	*	*	*										
Control internal carbon dioxide and contaminants	*	*	*	*	*	*	*	*	*	*	*	*		*	*				
Provide water	*	*	*	*	*	*	*	*											

A3.2.1.2.2.3 Capability: Develop increment operations planning products.

The purpose of this capability is to provide for development of increment plans for on–orbit/ ground station and payload operations plans and integration of payload and station operations plans during the pre–increment time frame. The MSS equipment shall support development of the increment operations planning products for the space station for a minimum of 5 and a maximum of 6 flights per year.

A3.2.1.2.2.4 Capability: Develop weekly planning products.

The purpose of this capability is to provide for development of station and payload operations planning products required to support real–time on–orbit/ ground operations. The MSS equipment shall support development of weekly integrated planning products for on–orbit/ ground system operations for a minimum of 5 and a maximum of 6 flights per year.

A3.2.1.2.2.5 Capability: Perform real–time planning support.

The purpose of this capability is to provide for real–time planning of station, payload and integrated operations in support of real–time operations. The MSS equipment shall support development of real–time planning products based on user, crew and ground controller requirements.

A3.2.1.3 Reserved

A3.2.1.4 Reserved

A3.2.1.5 Reserved

A3.2.1.6 Reserved

A3.2.1.7 Year 2000 Compliance

The CGS shall be capable of supporting operations at and subsequent to the transition to the year 2000.

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A3.2.2 Physical characteristics.

A3.2.3 Reliability

A3.2.4 Maintainability

A3.2.5 Availability

A3.2.6 Environmental conditions.

A3.2.6.1 Ground environments.

A3.2.6.1.1 Facility environments.

NA

A3.2.6.1.2 Transportation environments.

NA

A3.2.6.1.3 Storage and processing environments.

A3.2.7 Transportability.

A3.3 Design and Construction.

A3.3.1 Materials, processes, and parts.

A3.3.2 Electromagnetic radiation.

A3.3.3 Nameplates and product marking.

A3.3.4 Workmanship

A3.3.5 Interchangeability

A3.3.6 Safety.

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A3.4 Computer resource requirements.

A3.5 Logistics.

A3.6 Personnel and training.

A3.7 Characteristics of major functional elements.

A3.7.1 Canadian Ground Segment.

A3.7.1.1 Purpose.

A3.7.1.2 Description.

The CGS provides facilities and equipment required to support the on–orbit portions of the MSS and Canadian payloads. This includes the ability to receive data from and receive video from the

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on–orbit portions of MSS and the Canadian payloads.

A3.7.1.3 Capabilities

A3.7.1.3.1 Space Station system performance analysis.

A3.7.1.3.1.1 Analyze operations performance.

The CGS shall analyze the MSS performance relative to predetermined limits and expected performance. The CGS shall trend on–orbit MSS performance data. The CGS shall track anomalies, support cause determination and develop recommendations for restoring systems to expected performance.

A3.7.1.3.1.2 Manage station configuration.

The CGS shall provide inputs to the on–orbit MSS configuration status and history.

A3.7.1.3.1.3 Manage station maintenance.

The CGS shall support management of MSS maintenance.

A3.7.1.3.2 Support on–orbit operations.

A3.7.1.3.2.1 Monitor and assess on–orbit operations.

The CGS shall support the determination of on–orbit MSS operations status. The CGS shall support the determination of planned and alternative on–orbit/ground MSS operations to be performed.

A3.7.1.3.2.2 Execute on–orbit station operations.

The CGS shall provide for the generation of MSS data for uplink.

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A3.7.1.3.2.3 Execute ground operations.

The CGS shall provide for receipt and transmission of communications required to support ground operations coordination for on–orbit MSS operations.

A3.7.1.3.3 Provide data for uplink.

A3.7.1.3.3.1 Acquire data for uplink.

The CGS shall provide for the acquisition of MSS data intended for uplink.

A3.7.1.3.3.2 Prepare data for uplink to on–orbit station.

The CGS shall prepare MSS data for uplink.

The CGS shall comply with security and privacy requirements developed by the ISSA Program Office for transmission of data for uplink.

A3.7.1.3.3.3 Transmit data for uplink.

The CGS shall transmit MSS data intended for uplink to the Ground Communication System external interface.

A3.7.1.3.4 Support downlinked data.

A3.7.1.3.4.1 Receive downlinked data.

The CGS shall provide for the receipt of data from the Ground Communications System external interface.

A3.7.1.3.4.2 Record downlinked data.

The CGS shall provide for the recording of downlinked MSS data.

A3.7.1.3.4.3 Archive recorded flight–ground data.

The CGS shall provide for the archival of downlinked MSS data.

A3.7.1.3.4.4 Playback recorded flight–ground data.

The CGS shall provide for the playback of recorded or archived MSS data.

The CGS shall comply with security and privacy requirements developed by the ISSA Program Office for transmission of downlinked data.

A3.7.1.3.5 Perform task training.

A3.7.1.3.5.1 Perform Space Station system task training.

The CGS shall provide training devices or facilities for the preparation and conduct of space station systems task training for up to six flights per year.

A3.7.1.3.5.2 Perform payload task training.

The CGS shall provide training devices or facilities for the preparation and conduct of payload task training for up to six flights per year.

A3.7.1.3.6 Perform functional training.

A3.7.1.3.6.1 Perform Space Station system functional training.

The CGS shall provide training devices or facilities for the preparation and conduct of space station system functional training for up to six flights per year.

A3.7.1.3.6.2 Perform payload functional training.

The CGS shall provide training devices or facilities for the preparation and conduct of payload functional training for up to six flights per year.

A3.7.1.3.7 Perform operations training.

A3.7.1.3.7.1 Perform NASA operations training.

The CGS shall provide training devices or facilities for the preparation and conduct of National Aeronautics and Space Administration (NASA) operations training for up to six flights per year. **SCN 007**

A3.7.1.3.7.2 Perform international partner operations training.

CGS shall provide training devices or facilities for the preparation and conduct of International Partner operations training for up to six flights per year.

A3.7.1.3.8 Preliminary procedures.

A3.7.1.3.8.1 Draft preliminary procedures.

The CGS shall draft MSS procedures for real–time ground, on–orbit automated, and on–orbit manual operations for a minimum of 5 flights and a maximum of 6 flights per year.

A3.7.1.3.8.2 Validate preliminary procedures.

The CGS shall validate the MSS procedures developed to perform flight and ground controller operations and ground operations. The CGS shall verify MSS software and data modifications to support increment by increment updates for a minimum of 5 and a maximum of 6 flights per year.

A3.7.1.3.8.3 Revise preliminary procedures.

The CGS shall provide for revision of MSS procedures based on execution experience and revision requests for a minimum of 5 and a maximum of 6 flights per year.

A3.7.1.3.8.4 Control preliminary procedure configuration.

The CGS shall provide configuration control for MSS ground operations procedures, on–orbit automated procedures and on–orbit manual procedures for a minimum of 5 and a maximum of 6 flights per year.

A3.7.1.3.8.5 Transfer preliminary procedures.

The CGS shall transfer preliminary MSS procedures to the final procedure storage location for a minimum of 5 and a maximum of 6 flights per year.

A3.7.1.3.9 Perform resupply/return planning.

A3.7.1.3.9.1 Define cargo item resupply/return requirements.

The CGS shall support definition and update of the increment resupply/return cargo item requirements including physical data, MSS constraints, unique transportation requirements for a minimum of 5 and a maximum of 6 flights per year.

A3.7.1.3.9.2 Develop detailed resupply/return manifests.

The MSS shall support development and update of detailed resupply/return manifests that integrate the lists of payload, flight crew, and system cargo items needed by increment operations for a minimum of 5 and a maximum of 6 flights per year.

A3.7.1.3.10 Develop increment operations planning products.

A3.7.1.3.10.1 Develop MSS increment operations planning products.

The CGS shall provide for development of MSS on–orbit/ground increment operations planning products for a minimum of 5 and a maximum of 6 flights per year.

A3.7.1.3.10.2 Develop integrated increment operations planning products.

The CGS shall support integration of station, payload, and MSS on–orbit/ground operations plans affecting on–orbit station operations for a minimum of 5 and a maximum of 6 flights per year.

A3.7.1.3.11 Develop weekly planning products.

A3.7.1.3.11.1 Develop MSS weekly planning products.

The CGS shall provide for development of MSS on–orbit/ground weekly planning products.

A3.7.1.3.11.2 Develop integrated weekly operations planning products.

The CGS shall support integration of station, payload, and MSS on–orbit/ground operation plans for plans affecting on–orbit station operations.

A3.7.1.3.12 Perform real–time planning support.

A3.7.1.3.12.1 Perform MSS operations real–time planning support.

The CGS shall provide for the real–time planning of MSS on–orbit/ground operations in response to user, crew, and ground controller requirements.

A3.7.1.3.12.2 Perform integrated real–time planning support.

The CGS shall support the integrated real–time planning of MSS operations affecting on–orbit station operations and on–orbit station operations affecting MSS operations.

A3.8 Precedence.

The MSS requirements precedence shall be as follows:

A4. QUALITY ASSURANCE PROVISIONS

This section contains the formal qualification requirements that are necessary to show compliance with each ”shall” statement in section 3.0 of this document. Non ”shall” statements will not, and are not required to be quality assurance checked for compliance. This qualification consists of:

a. Data for the reliability analysis will be collected and recorded during qualification.

b. Engineering (development) evaluation and tests may be required for analyzing design approaches to ensure that requirements encompassing material selection, tolerances, and operational characteristics are satisfied. If development test data is intended to be used to qualify hardware, its intent shall be predeclared.

c. Qualification requirements are specified in sections 4.2 and 4.3. Qualification represents the broadest scope of verification within design tolerances to which a configuration/end item is subjected. It encompasses the entire range of activity to verify that the design conforms to requirements when subjected to environmental life–cycle conditions. Flight–like hardware is normally used for qualification testing. If actual flight hardware is used for qualification testing, it shall be in accordance with SSP 41172. Environmental models shall be used to represent environments that cannot be achieved under the conditions of ground testing. Simulators, used for verifying requirements, require validation so that the item undergoing qualification can not distinguish between the simulator and actual operational hardware/software.

d. Integration testing and checkout shall be conducted during end item buildup. Activities such as continuity checking and interface mating will be performed. Activities such as major component operation in the installed environment, support equipment compatibility, and documentation verification will be proven during qualification.

e. Formal verification of performance characteristics occurs for the full range of performance requirements during qualification and for nominal operational and critical physical requirements during acceptance.

A4.1 General.

In general, system level qualification will be conducted by inspection of segment level qualification results. When inspection of segment level qualification results is not adequate to prove compliance with the stated requirement, system level qualification activities will be conducted as identified in section 4.3.

The following methods are defined and shall be used to qualify the segment.

INSPECTION. Inspection is a method that determines conformance to requirements by the review of drawings, data or by visual examination of the item using standard quality control methods, without the use of special laboratory procedures.

ANALYSIS. Analysis is a process used in lieu of, or in addition to, other methods to ensure compliance to specification requirements. The selected techniques may include, but not be limited to, engineering analysis, statistics and qualitative analysis, computer and hardware simulations, and analog modeling. Analysis may also include assessing the results of lower level qualification results. Analysis may be used when it can be determined that (1) rigorous and accurate analysis is possible, (2) test is not cost effective, and (3) inspection is not adequate.

Verification by similarity is the process of analyzing the specification criteria for hardware configuration and application for an article to determine if it is similar or identical in design, manufacturing process, and quality control to an existing article that has previously been qualified to equivalent or more stringent specification criteria. Special effort will be made to avoid duplication of previous tests from this or similar programs. If the previous application is considered to be similar, but not equal to or greater in severity, additional qualification tests shall concentrate on the areas of new or increased requirements.

DEMONSTRATION. Demonstration consists of a qualitative determination of the properties of a test article. This qualitative determination is made through observation, with or without special test equipment or instrumentation, which verifies characteristics such as human engineering features, services, access features, and transportability. Demonstration requirements are normally implemented within a test plan, operations plan, or test procedures.

TEST. Test is a method in which technical means, such as the use of special equipment, instrumentation, simulation techniques, and the application of established principles and procedures, are used for the evaluation of components, subsystems, and systems to determine compliance with requirements. Test shall be selected as the primary method when analytical techniques do not produce adequate results; failure modes exist which could compromise personnel safety, adversely affect flight systems or payload operation, or result in a loss of mission objectives; or for any components directly associated with Space Station and Orbiter interfaces. The analysis of data derived from tests is an integral part of the test program, and should not be confused with analysis as defined above. Tests shall be used to determine quantitative compliance to requirements and produce quantitative results.

A4.1.1 Responsibility for verifications.

Unless otherwise specified CSA is responsible for the performance of verification activities as specified herein. Except as otherwise specified CSA shall use their own or any other facility suitable for the performance of the verification activities specified herein.

A4.2 System quality conformance inspections.

Mandatory qualification tests are as specified in SSP 41172. Demonstrations, analyses, inspections, and any additional test requirements are specified herein. Individual verification requirements do not require a stand alone verification to be performed but may be combined with satisfying other verification requirements to prevent redundancy and optimize commonality.

A4.2.1 Requirement/verification cross reference matrix.

The requirement/verification cross reference matrix is not required for this specification. This specification has a one to one correspondence between section 3 and section 4. The requirements in section 3 (requirements start with 3.2.1) each have a corresponding section 4 verification paragraph that uses a ”4.” prefix added to the section 3 paragraph number. (Example requirement paragraph 3.2.1.1.1.1 has a corresponding verification paragraph 4.3.2.1.1.1.1)

A4.3 System level verification requirements.

This section includes the qualification requirements that must be satisfied at the system level.

A4.3.1 Analysis of segment results.

Verification of this requirement shall be by analysis of the applicable segment qualification results. The qualification will be considered successful when the applicable segment level test, demonstration, analysis or inspection requirement are shown to be satisfied.

A4.3.2 Characteristics.

A4.3.2.1 Performance characteristics.

A4.3.2.1.1 State: Perform mission – habitable.

A4.3.2.1.1.1 Mode: Standard – habitable.

####### A4.3.2.1.1.1.1 Space Station system performance analysis.

Deleted.

####### A4.3.2.1.1.1.2 Support on–orbit operations.

Deleted.

####### A4.3.2.1.1.1.3 Provide data for uplink.

Verification of Provide data for uplink shall be by analysis of end item qualification results. The following end item function qualification results will be analyzed: Transmit data for uplink. Verification shall be considered successful when the above named end item test, or demonstration, requirements are shown to be satisfied.

A4.3.2.1.1.1.4 Support downlinked data.

Verification of support downlinked data shall be by analysis of end item qualification results. Receive downlinked data end item function qualification result shall be analyzed. Verification shall be considered successful when the above named end item test, or demonstration requirements are shown to be satisfied.

A4.3.2.1.2 State: Support mission.

A4.3.2.1.2.1 Mode: Personnel preparation.

NA

A4.3.2.1.2.1.1 Perform task training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that task training hardware, software, and facilities are capable of preparing and conducting training for each student group. The verification shall be considered successful when the analysis results indicate that task training for each student group is capable of supporting six flights per year.

A4.3.2.1.2.1.2 Perform functional training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that functional training hardware, software, and facilities are capable of preparing and conducting training for each student group. The verification shall be considered successful when the analysis results indicate that functional training for each student group is capable of supporting six flights per year.

A4.3.2.1.2.1.3 Perform operations training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that operations training hardware, software, and facilities are capable of preparing and conducting training for each student group. The verification shall be considered successful when the analysis results indicate that operations training for each student group is capable of supporting six flights per year.

A4.3.2.1.2.2 Mode: Operations planning.

NA

A4.3.2.1.2.2.1 Develop preliminary procedures.

The capability to develop procedures shall be verified by analysis. The analysis shall be based on results of end item qualification activity. The qualification will be considered successful when the applicable end item test, demonstration, analysis or inspection requirements are shown satisfied.

A4.3.2.1.2.2.2 Perform resupply/return planning.

The capability to resupply/return planning products shall be verified by analysis. The analysis shall be based on results of end item qualification activity. The qualification will be considered successful when the applicable end item test, demonstration, analysis or inspection requirements are shown satisfied.

A4.3.2.1.2.2.3 Develop increment operations planning products.

The capability to develop increment operations planning products shall be verified by analysis. The analysis shall be based on results of end item qualification activity. The qualification will be considered successful when the applicable end item test, demonstration, analysis or inspection requirements are shown satisfied.

A4.3.2.1.2.2.4 Develop weekly planning products.

The capability to develop weekly planning products shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis or inspection requirements are shown to be satisfied.

A4.3.2.1.2.2.5 Perform real–time planning support.

The capability to perform real–time planning support shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis or inspection requirements are shown to be satisfied.

A4.3.2.1.3 Reserved

A4.3.2.1.4 Reserved

A4.3.2.1.5 Reserved

A4.3.2.1.6 Reserved

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A4.3.2.1.7 Year 2000 Compliance

This requirement shall be verified by test and analysis. All hardware and software supporting operations shall be verified to ensure proper operation at and subsequent to the transition from December 31, 1999, to January 1, 2000.

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A4.3.2.2 Physical Characteristics.

A4.3.2.3 Reliability.

A4.3.2.4 Maintainability.

A4.3.2.5 Availability.

A4.3.2.6 Environmental conditions.

A4.3.2.6.1 Ground environments.

A4.3.2.6.1.1 Facility environments.

NA

A4.3.2.6.1.2 Transportation environments.

NA

A4.3.2.6.1.3 Storage environments.

Segment level verification shall be accomplished by inspection of lower level qualification records.

A4.3.2.7 Transportability.

Segment level verificaiton shall be accomplished by inspection of lower level qualification records.

A4.3.3 Design and construction.

A4.3.3.1 Materials, processes, and parts.

A4.3.3.2 Electromagnetic radiation.

A4.3.3.3 Nameplates and product marking.

A4.3.3.4 Workmanship.

A4.3.3.5 Interchangeability.

A4.3.3.6 Safety.

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A4.3.4 Computer resource requirements.

A4.3.5 Logistics.

A4.3.6 Personnel and training.

A4.3.7 Characteristics of major functional elements.

A4.3.7.1 Canadian Ground Segment.

A4.3.7.1.1 Purpose.

A4.3.7.1.2 Description.

A4.3.7.1.3 Capabilities.

A4.3.7.1.3.1 Space Station system performance analysis.

A4.3.7.1.3.1.1 Analyze operations performance.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS analysis hardware, software, and facilities are capable of performing operations performance analysis. Verification shall be considered successful when analysis results show that CGS is capable of analyzing operations performance of MSS for continuous operations.

A4.3.7.1.3.1.2 Manage station configuration.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS configuration hardware, software, and facilities are capable of supporting MSS configuration management. The verification shall be considered successful when analysis results show that CGS is capable of accurately maintaining a record of MSS configuration and providing MSS configuration inputs to the Space Station Control Center (SSCC).

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A4.3.7.1.3.1.3 Manage station maintenance.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS configuration hardware, software, and facilities are capable of supporting MSS maintenance management. The verification shall be considered successful when analysis results show that CGS is capable of providing MSS maintenance inputs to SSCC.

A4.3.7.1.3.2 Support on–orbit operations.

A4.3.7.1.3.2.1 Monitor and assess on–orbit operations.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS hardware, software, and facilities are capable of performing on–orbit operations. Verification shall be considered successful when analysis results show that CGS is capable of determining on—orbit MSS operations status and supporting operations development for continuous operations.

A4.3.7.1.3.2.2 Execute on–orbit station operations.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS hardware, software, and facilities are capable of generating MSS data for uplink.

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Verification shall be considered successful when analysis results show that CGS is capable of providing SSCC with data for continuous operations.

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A4.3.7.1.3.2.3 Execute ground operations.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS hardware, software, and facilities are capable of receipt and transmission of communications supporting MSS ground operations coordination. Verification shall be considered successful when analysis results show that CGS is capable of ground operations coordination communications for continuous operations.

A4.3.7.1.3.3 Provide data for uplink.

A4.3.7.1.3.3.1 Acquire data for uplink.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS hardware, software, and facilities are capable of acquiring MSS data for uplink. Verification shall be considered successful when analysis results show that CGS is capable of acquisition of MSS commands and data intended for uplink.

A4.3.7.1.3.3.2 Prepare data for uplink to on–orbit station.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS hardware, software, and facilities are capable of preparing MSS data for uplink. Verification shall be considered successful when analysis results show that CGS is capable of preparing acquired MSS commands and data for transmission to the ground communications system external interface.

A4.3.7.1.3.3.3 Transmit data for uplink.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS hardware, software, and facilities are capable of transmitting MSS data to the ground communications system external interface. Verification shall be considered successful when analysis results show that CGS is capable of transmitting prepared MSS commands and data to the ground communications system external interface.

A4.3.7.1.3.4 Support downlinked data.

A4.3.7.1.3.4.1 Receive downlinked data.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS hardware, software, and facilities are capable of receiving downlinked MSS data. Verification shall be considered successful when analysis results show that CGS is capable of receiving MSS data for analysis from the ground communications system external interface.

A4.3.7.1.3.4.2 Record downlinked data.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS hardware, software, and facilities are capable of recording downlinked MSS data. Verification shall be considered successful when analysis results show that CGS is capable of recording MSS data for later playback and analysis.

A4.3.7.1.3.4.3 Archive recorded flight–ground data.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS hardware, software, and facilities are capable of archiving downlinked MSS data. Verification shall be considered successful when analysis results show that CGS is capable of archiving MSS data.

A4.3.7.1.3.4.4 Playback recorded flight–ground data.

An analysis shall be performed based upon data obtained from CGS operational simulations to verify that CGS hardware, software, and facilities are capable of playback of MSS data. Verification shall be considered successful when analysis results show that CGS is capable of playback for analysis of recorded MSS data.

A4.3.7.1.3.5 Perform Space Station system task training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that task training hardware, software, and facilities are capable of preparing and conducting training for each student group. The verification shall be considered successful when the analysis results indicate that space station system task training for each student group is capable of supporting 6 flights per year.

A4.3.7.1.3.5.1 Perform payload task training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that task training hardware, software, and facilities are capable of preparing and conducting training for each student group. The verification shall be considered successful when the analysis results indicate that payload task training for each student group is capable of supporting 6 flights per year.

A4.3.7.1.3.6 Perform functional training.

A4.3.7.1.3.6.1 Perform Space Station system functional training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that functional training hardware, software, and facilities are capable of preparing and conducting training for each student group. The verification shall be considered successful when the analysis results indicate that space station system functional training for each student group is capable of supporting 6 flights per year.

A4.3.7.1.3.6.2 Perform payload functional training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that functional training hardware, software, and facilities are capable of preparing and conducting training for each student group. The verification shall be considered successful when the analysis results indicate that payload functional training for each student group is capable of supporting 6 flights per year.

A4.3.7.1.3.7 Preliminary procedures.

A4.3.7.1.3.7.1 Draft preliminary procedures.

The capability to draft preliminary procedures shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.7.2 Validate preliminary procedures.

The capability to validate preliminary procedures shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.7.3 Revise preliminary procedures.

The capability to revise preliminary procedures shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.7.4 Control preliminary procedure configuration.

The capability to control preliminary procedures configuration shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.7.5 Transfer preliminary procedures.

The capability to transfer preliminary procedures shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.8 Perform resupply/return planning.

NA

A4.3.7.1.3.8.1 Define cargo item resupply/return requirements.

The capability to support definition of cargo item resupply/return requirements shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.8.2 Develop detailed resupply/return manifests.

The capability to support development of resupply/return manifests shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.9 Develop increment operations planning products.

NA

A4.3.7.1.3.9.1 Develop MSS increment operations planning products.

The capability to develop MSS increment operations planning products shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.9.2 Develop integrated increment operations planning products.

The capability to support development of integrated increment operations planning products shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.10 Develop weekly planning products.

NA

A4.3.7.1.3.10.1 Develop MSS weekly planning products.

The capability to develop MSS weekly planning products shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.10.2 Develop integrated weekly operations planning products.

The capability to support development of integrated weekly planning products shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.11 Perform real–time planning support.

NA

A4.3.7.1.3.11.1 Perform MSS operations real–time planning support.

The capability to perform MSS operations real–time planning support shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The

qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A4.3.7.1.3.11.2 Perform integrated real–time planning support.

The capability to provide integration of real–time planning support shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

A5. PREPARATION FOR DELIVERY

A5.1 General.

A5.2 Detail requirements.

A5.2.1 Preservation and packaging.

A5.2.2 Marking for shipment.

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approximately 24 months prior to an increment and ends with the completion of the increment. This mode consists of the capabilities as shown in Table II.

B3.2.1.2.5.2 Capability: Perform resupply return planning.

The ESA ground segment shall support development of resupply/return plans for the on–orbit APM and ESA payloads and ESA flight crew cargo items needed for increment operations.

B3.2.1.2.5.3 Capability: Develop increment operations planning products.

The ESA ground segment shall develop, maintain and transmit to the USGS, the data required for preincrement planning.

B3.2.1.2.5.4 Capability: Develop weekly planning products.

The ESA ground segment shall support the development of the weekly Short Term Plan (STP).

B3.2.1.2.5.5 Capability: Perform realtime planning support.

The ESA ground segment shall provide the capability to support the USGS realtime replanning.

B3.2.1.2.6 Mode: Reconfiguration preparation.

This mode consists of those functions required to integrate and verify ISS reconfiguration products to support specific increments.

B3.2.1.3 Reserved

B3.2.1.4 Reserved

B3.2.1.5 Reserved

B3.2.1.6 Reserved

B3.2.1.7 Year 2000 Compliance

The ESA ground segment shall be capable of supporting operations at and subsequent to the transition to the year 2000.

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B3.2.2 ESA Ground System

B3.2.2.1 Control of Hazardous Commands

a. All hazardous commands must be identified in an ESA Ground System command database.

b. The ESA Ground System shall be capable of identifying hazardous commands embedded within multiple command strings and shall inhibit transmission for uplink.

c. The ESA Ground System shall ensure command data integrity throughout the ESA Ground System command path.

d. The ESA Ground System command path components shall be monitored for failures.

e. The ESA Ground System shall cease commanding when failure is detected in a command path component until such time that the failure is either resolved or a substitute component is brought online.

f. The ESA Ground System shall check for data corruption when retrieving commands from internal and external storage.

g. The structure of ESA Ground System command messages shall provide for unique identification of hazardous commands destined for uplink.

h. The ESA Ground System shall inhibit transmission of all commands identified as hazardous, including those embedded in chains or blocks.

i. No inhibited command from the ESA Ground System shall be transmitted for uplink without specific operator action.

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B3.3 Design and construction.

B3.3.1 Materials, processes, and parts.

B3.3.2 Electromagnetic radiation.

B3.3.3 Nameplates and product marking.

B3.3.4 Workmanship.

B3.3.5 Interchangeability.

B3.3.6 Safety.

B3.3.6.1 Hazardous commands.

Ground and on–board crew initiated commands involving safety critical functions shall be two–step operations, with positive feedback to the initiator reporting the impending results of the commands, prior to acceptance of the execute command.

B3.4 Computer resource requirements.

B3.5 Logistics.

B3.5.1 Maintenance.

B3.5.2 Supply.

Not applicable.

B3.5.3 Facilities and facility equipment.

Not applicable.

B3.6 Personnel and training.

Not applicable.

B3.6.1 Personnel.

Not applicable.

B3.6.2 Training.

Not applicable.

B3.7 Characteristics of major functional elements.

B3.7.1 APM.

B3.8 Precedence.

Not applicable.

B4. QUALITY ASSURANCE PROVISIONS

B4.1 Reserved

B4.2 Reserved

B4.3 Reserved

B4.3.1 Reserved

B4.3.2 Reserved

B4.3.2.1 Reserved

B4.3.2.1.1 Reserved

B4.3.2.1.2 Reserved

B4.3.2.1.3 Reserved

B4.3.2.1.4 Reserved

B4.3.2.1.5 Reserved

B4.3.2.1.6 Reserved

B4.3.2.1.7 Year 2000 Compliance

This requirement shall be verified by test and analysis. All hardware and software supporting operations shall be verified to ensure proper operation at and subsequent to the transition from December 31, 1999, to January 1, 2000.

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TABLES

FIGURES

D3.2.1.2.2.1.4 Capability: Perform real–time planning support.

The JEM ground system shall provide the capability to support the USGS real–time planning and replanning.

D3.2.1.2.2.2 Capability: Develop and maintain procedures.

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D3.2.1.2.2.2.1 Capability: Develop preliminary procedures.

The JEM ground system shall provide the capability to develop JEM operations procedures.

Operations procedures and reference information shall be developed in accordance with SSP 50200–08 Appendix D Operations Data File Standards and SSP 50200–08 Appendix E Operations Nomenclature.

D3.2.1.2.2.2.2 Capability: Maintain final procedures.

The JEM ground system shall provide the capability to store JEM operations procedures.

The JEM ground system shall provide the capability to maintain JEM operations procedures.

D3.2.1.2.2.2.3 Capability: Deliver final procedures.

The JEM ground system shall provide the capability to produce final JEM operations procedures.

The JEM ground system shall provide the capability to deliver final JEM operations procedures.

D3.2.1.2.3 Mode: Reconfiguration preparation.

D3.2.1.2.3.1 Capability: Integrate reconfiguration products.

D3.2.1.2.3.1.1 Capability: Provide reconfiguration products and data files.

The JEM ground system shall support the build and management of JEM reconfiguration products and data.

D3.2.1.2.3.1.2 Capability: Verify reconfiguration products.

The JEM ground system shall verify JEM reconfiguration products.

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D3.2.1.3 Reserved

D3.2.1.4 Reserved

D3.2.1.5 Reserved

D3.2.1.6 Reserved

D3.2.1.7 Year 2000 Compliance

The JEM ground system shall be capable of supporting operations at and subsequent to the transition to the year 2000.

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D3.3 Design and construction.

D3.3.1 Workmanship.

Not applicable

D3.3.2 Interchangeability.

D3.3.3 Safety.

D3.3.3.1 Hazardous commands.

The JEM Ground segment shall ensure that ground–based commanding of on–orbit elements is performed in a safe and nonhazardous manner. This shall include positive control of hazardous commands.

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D3.4 Computer resource requirements.

D3.5 Logistics.

D3.6 Personnel and training.

D3.7 Characteristics of major functional elements.

D3.7.1 JEM ground system.

D3.7.1.1 Purpose.

The purpose of the JEM ground system is to support the JEM flight system, Japanese payloads, and Japanese users both before and during on–orbit operations.

D3.7.1.2 Description.

The JEM ground system facilities are located in the Japanese Space Station Integration and Promotion Center (SSIPC) and comprises the computers, simulators, and other equipment to perform JEM engineering assessments, payload operations and user support, Japanese payload integration, logistics operations, and crew training for JEM system and Japanese payload operations.

D3.7.1.3 Capabilities.

The capabilities of the JEM ground system are described in accordance with NASDA–ESPC–1539, Operations System Specification.

D3.7.1.4 Control of Hazardous Commands

a. All JEM hazardous commands must be identified in a JEM Ground System command database.

b. The JEM Ground System shall be capable of identifying JEM hazardous commands embedded within multiple command strings and shall inhibit transmission for uplink.

c. The JEM Ground System shall ensure command data integrity throughout the JEM Ground System command path.

d. The JEM Ground System command path components shall be monitored for failures.

e. The JEM Ground System shall cease commanding when failure is detected in a command path component until such time that the failure is either resolved or a substitute component is brought on line.

f. The JEM Ground System shall check for data corruption when retrieving commands from internal and external storage.

g. The structure of JEM Ground System command messages shall provide for unique identification of hazardous commands destined for uplink.

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h. The JEM Ground System shall inhibit transmission of all commands identified as hazardous, including those embedded in chains or blocks.

i. No inhibited command from the JEM Ground System shall be transmitted for uplink without specific operator action.

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D3.8 Precedence.

All specifications, standards, exhibits, drawings or other documents that are referenced in this specification are hereby incorporated as cited. All documents that are referred to by a reference document are considered to be for guidance and information only, with the exception of ICDs and Interface Requirements Documents (IRDs), which shall have their reference documents considered to be incorporated as cited. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. This document also takes precedence over the Space Station system specification. Nothing in this document, however, supercedes applicable laws and regulations unless a specific exemption has been obtained.

D4. QUALITY ASSURANCE PROVISIONS

D4.1 General.

JEM segment level qualification will be conducted by inspection, analysis, demonstration, or test. Test is chosen as the verification method to verify performance requirements that are not readily observable.

These methods are defined as follows:

a. Inspection. Engineering, inspection, hereafter referred to as inspection, is a method of verification that determines conformance to requirements by the use of standard quality control methods to ensure compliance by review of drawings and data. This method is used wherever documents or data can be visually used to verify the physical characteristics of the product instead of of the performance of the product.

b. Analysis. Analysis is a process used in lieu of, or in addition to, other methods to ensure compliance to specification requirements. The selected techniques may include, but not be limited to, engineering analysis, statistics and qualitative analysis, computer and hardware simulations, and analog modeling. Analysis may be used when it can be determined that (1) rigorous and accurate analysis is possible, (2) test is not cost effective, and (3) verification by inspection is not adequate.

c. Verification by similarity is the process of analyzing the specification criteria for hardware configuration and application for an article to determine if it is similar or identical in design, manufacturing process, and quality control to an existing article that has previously been qualified to equivalent or more stringent specification criteria. Special effort will be made to avoid duplication of previous tests from this or similar programs. If the previous application is considered to be similar, but not equal to or greater in severity, additional qualification tests shall concentrate on the areas of new or increased requirements.

d. Demonstration. Demonstration consists of a qualitative determination of the properties of a test article. This qualitative determination is made through observation, with or without special test equipment or instrumentation, which verifies characteristics such as human engineering features, services, access features, and transportability. Demonstration requirements are normally implemented within a test plan, operations plan, or test procedure.

e. Test. Test is a method in which technical means, such as the use of special equipment, instrumentation, simulation techniques, and the application of established principles and procedures, are used for the evaluation of components, subsystems, and systems to determine compliance with requirements. Test shall be selected as the primary method when analytical techniques do not produce adequate results; failure modes exist which could compromise personnel safety, adversely affect flight systems or payload operation, or result in a loss of mission objectives; or for any components directly associated with Space Station and orbiter interfaces. The analysis of data derived from tests is an integral part of the test program, and should not be confused with analysis as defined above. Tests shall be used to determine quantitative compliance to requirements and produce quantitative results.

D4.1.1 Responsibility for verifications.

NASDA is responsible for verifying the JEM fulfills the performance and constraint requirements set forth within this specification.

D4.1.2 Special tests and examinations.

Not applicable.

D4.2 Segment quality conformance inspections.

D4.2.1 Requirement/verification cross reference matrix.

Not applicable.

D4.3 Reserved

D4.3.1 Reserved

D4.3.2 Reserved

D4.3.2.1 Reserved

D4.3.2.1.1 Reserved

D4.3.2.1.2 Reserved

D4.3.2.1.3 Reserved

D4.3.2.1.4 Reserved

D4.3.2.1.5 Reserved

D4.3.2.1.6 Reserved

D4.3.2.1.7 Year 2000 Compliance

This requirement shall be verified by test and analysis. All hardware and software supporting operations shall be verified to ensure proper operation through the transition from December 31, 1999, to January 1, 2000.

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D5. PREPARATION FOR DELIVERY.

NA.

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TABLES

FIGURES

E3. SYSTEM REQUIREMENTS

E3.1 System definition.

E3.1.1 System description.

E3.1.1.1 Russian Ground Segment (RGS).

The Russian Ground Segment provides the ground infrastructure capabilities required to support all Russian Space Agency (RSA) flight elements (specified elsewhere in this document), RSA payloads, and selected capabilities supporting the United States Ground Segment (USGS). The RGS provides planning, ground processing, training, communications, and mission operations (esp. command and control) support capabilities for each Russian element and Russian payloads.

E3.1.2 Missions.

E3.1.3 Threat.

Not Applicable.

E3.1.4 Reserved.

E3.1.5 Interface requirements.

E3.1.5.1 External interfaces.

The external segment–to–segment interfaces of the Russian Segment are depicted in Figure E–1. The following subparagraphs identify the external interfaces of the Russian Segment.

TBD

FIGURE E–1. External RS interfaces.

E3.1.5.1.1 United States Ground Segment external interface description.

The RGS interfaces with the USGS, thus supporting USOS and Russian On-Orbit Segment (ROS) command and telemetry transfer and other ground mission operations functions. In addition to routine planned support for prelaunch, launch, on–orbit, and training operations, this interface includes data transfers necessary to support the following:

a. Control Center Backup – Interface support for the SSCC to backup essential functions of Mission Control Center–Moscow (MCC–M) and for MCC–M to backup essential functions of the SSCC.

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b. Support Groups – Support for the Houston Support Group (HSG) in the MCC–M and the Russian Regional Control Group (RRCG) in the SSCC.

The interface includes two–way exchange of ground control and coordination functions including the following: communications (data, voice, video, and files); operational planning products and data (ISS systems and payloads); training data; logistics support coordination data; launch services coordination data; and engineering support data regarding Russian hardware, software, payloads, and activities. The USGS to RGS control center interfaces are defined in SSP 50057, SSCC to RSA Ground Segment ICD. Training Facility interfaces are defined in SSP 50069, SSTF to RST ICD.

The USGS can interface with the USOS via the RGS and ROS. Likewise, the RGS can interface with the ROS via the USGS and USOS. This interface supports commanding and telemetry with either the RGS or USGS. All commands and data transferred between the USOS and the ROS shall be in accordance with SSP 50097, SSMD to RS SW ICD. The capabilities of the RGS interface with the USOS via the ROS, and the USGS interface to the ROS through the USOS are limited to the capabilities in SSP 50097.

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E3.1.5.2 Internal interfaces.

E3.1.5.2.1 Russian Ground Segment.

The RGS interfaces with the Russian Elements described within this section (Section 3.1.5.2). These interfaces consist of Russian facilities, communications systems data, hardware, software, training devices, models, simulations, and tools used internally to perform Russian ground system operations and ground mission operations.

E3.2 Characteristics.

E3.2.1 Performance characteristics.

E3.2.1.1 State: Perform mission – habitable.

E3.2.1.1.1 Mode: Standard – habitable.

E3.2.1.1.1.1 Support on–orbit to ground communication.

E3.2.1.1.1.1.1 Capability: Provide data for uplink. (RGS)

The RGS shall collect and transmit data (commands, voice, navigation, and video) intended for uplink to Russian resupply vehicles, the Russian on–orbit elements, or other on–orbit ISSA elements. The RGS shall provide capability to acquire, transfer, prepare, and transmit system and payload commands for uplink from sources external to the RGS in accordance with SSP TBD ICD.

AGREED

E3.2.1.2.3.1 Perform increment planning.

E3.2.1.2.3.1.1 Capability: Perform resupply/return planning.

The RS shall provide for development of resupply/return plans for the system, payloads, and flight crew cargo items for incremental operations . During prelaunch integration of cargo items into the launch package, the RS shall provide for updates to the incremental resupply/return plans caused by changes in on–orbit mission equipment for mission success.

AGREED.

E3.2.1.2.3.1.2 Capability: Develop increment operations planning products.

The RS shall provide for the development of the increment operations plans for the Space Station.

AGREED.

E3.2.1.2.3.1.3 Capability: Develop weekly planning products.

The RS shall provide for the development of weekly integration planning products for payloads and the on–orbit/ground station operations.

AGREED.

E3.2.1.2.3.1.4 Capability: Perform real time planning support.

The RS shall provide for the development of real time planning products based on user, crew, and ground controller requirements.

AGREED.

E3.2.1.2.3.2 Develop and maintain procedures.

E3.2.1.2.3.2.1 Capability: Develop procedures.

The RS shall provide the capability to develop ground mission operations procedures, on–orbit automated procedures, and on–orbit manual procedures.

AGREED.

E3.2.1.3 Reserved

E3.2.1.4 Reserved

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E3.2.1.5 Reserved

E3.2.1.6 Reserved

E3.2.1.7 Year 2000 Compliance

The Russian Ground Segment shall be capable of supporting operations before, during, and after the transition to the year 2000.

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E3.2.2 Reliability.

E3.2.2.1 Failure Tolerance.

The Russian Segment shall meet the system failure tolerance requirements as specified in Table E–1.

TABLE E–1. RS capability failure tolerances.

	Russian segment function	Capability paragraph number	Failure Tolerance Allocation
1	Perform task training		N/A
2	Perform functional training		N/A
3	Perform operations training		N/A
4	Develop preliminary procedures		N/A
5	Maintain final procedures		N/A
6	Deliver final procedures		N/A
7	Perform organization level maintenance – ground		N/A
8	Perform depot level maintenance		N/A
9	Perform resupply return planning		N/A
10	Develop increment operations planning products		N/A
11	Develop weekly planning products		N/A
12	Perform real time planning support		N/A

E3.3 Design and construction.

E3.3.1 Reserved.

E3.3.2 Reserved.

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E3.3.3 Reserved.

E3.3.4 Reserved.

E3.3.5 Reserved.

E3.3.6 Safety.

E3.3.6.1 Hazardous Commands.

The Russian ground systems shall support the ground–based commanding of the on–orbit elements in a safe manner.

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E3.4 Computer resource requirements.

E3.5 Logistics.

E3.6 Reserved.

E3.7 Characteristics of major functional elements.

E3.7.1 Soyuz Vehicle.

E3.7.1.1 Capabilities.

E3.7.1.1.1 Support crew delivery and return.

E3.7.1.1.1.1 Return mission.

E3.7.1.1.1.1.1 Ground support to flight operations.

Ground support shall be provided to Soyuz vehicle flight operations planning, mission design, and analysis, including: providing state vector information and landing site recommendation, calculating and verifying deorbit targets, and providing real–time consultation for a Soyuz vehicle return mission.

AGREED.

E3.7.2 Russian ground segment.

E3.7.2.1 Purpose.

The purpose of the Russian Ground Segment is to provide the ground infrastructure capabilities required to support all RSA flight elements (specified elsewhere in this document), RSA payloads, and selected capabilities supporting the USGS. The RGS provides planning, ground processing, training, communications, and mission operations support for each Russian element and Russian payloads.

AGREED.

E3.7.2.2 Description.

The Russian Ground Segment is the support infrastructure for Russian elements, payloads, and launch services. The RGS is comprised of facilities, communication services, Russian ground support equipment, tools, planning systems, training simulators and mockups, models, and launch support services.

The RGS requirements apply to RGS support to the Russian elements during all operational phases (nominal and contingency). Additionally, unless specified in the following requirements, they apply to RGS command and control of functions in support of the on–orbit USOS Elements.

AGREED.

E3.7.2.3 Capabilities:

E3.7.2.3.1 Space station system performance analysis.

E3.7.2.3.1.1 Analyze operations performance.

a. The RGS shall analyze the performance of on–orbit operations and data relative to predetermined limits and expected performance.

b. The RGS shall provide trend analyses for on–orbit operations performance data.

c. The RGS shall track anomalies, determine causes and develop recommendations for restoring systems to expected performance.

AGREED.

E3.7.2.3.1.2 Manage station configuration.

The RGS shall monitor the RS on–orbit hardware and software configuration status and history.

AGREED.

E3.7.2.3.1.3 Manage station resources.

The RGS shall manage ROS on–orbit resources.

AGREED.

E3.7.2.3.1.4 Manage station maintenance.

The RGS shall support maintenance of the ROS.

AGREED.

E3.7.2.3.1.5 Manage station systems inventory.

The RGS shall track and coordinate ROS inventory.

AGREED.

E3.7.2.3.2 Support on–orbit operations.

E3.7.2.3.2.1 Monitor and assess space station operations.

a. The RGS shall provide for the determination of on–orbit operations status and corresponding ground operations status.

b. The RGS shall provide for the comparison of on–orbit station operations and corresponding ground operations status with projected operations status.

c. The RGS shall provide for the determination of planned and alternative on–orbit/ground operations to be performed.

AGREED.

E3.7.2.3.2.2 Execute on–orbit station operations.

The following are ground segment requirements, which protect against inadvertent commanding of the onboard system.

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a. The RGS shall provide for ground based commanding of on–orbit station operations.

b. The RGS shall provide for the generation of data for uplink to the on–orbit station.

c. The RGS shall provide for audio communications between flight crew and ground controller personnel.

d. All commands shall be uniquely identified in the command database.

e. The RGS shall inhibit unauthorized transmission of all Russian commands to the RS ISS onboard systems.

f. Command data files destined for uplink shall be verified for data integrity prior to uplink to on–orbit elements.

g. RGS command path hardware and software shall be monitored prior to and during command uplink to ensure operational status.

h. Ground–based commanding shall be ceased when a failure is detected within the RGS command path.

i. Pre–planned ground–based command files shall be verified by the Russian flight control team prior to uplink to the on–orbit elements.

j. Generation and verification of ground–based command files shall be accomplished by authorized personnel using approved procedures.

k. All Russian commands to be transmitted in real–time to the RS ISS onboard systems shall have special algorithms to exclude inadvertent transmission of commands.

l. Specific operator action shall be the only method for transmitting Russian real–time commands.

m. Ground–based commanding shall be inhibited until the failure is either resolved or a substitute component is brought online.

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AGREED.

E3.7.2.3.2.3 Execute ground operations.

a. The RGS shall provide the ground–to–ground audio communications required to support ground operations coordination for on–orbit station and payload operations.

b. The RGS shall provide for the control of ground systems supporting on–orbit ISSA Elements and payloads operations.

AGREED.

E3.7.2.3.2.4 Control Center Command and Control Backup

a. The RGS shall provide the capability to support backup command and control of the ROS core systems from equipment, which is part of the RGS provided by RSA and located in the SSCC, utilizing USGS and USOS communication assets.

b. The backup MCC–M capability in the SSCC shall be able to sustain ROS core system operations until the problem causing backup control to be invoked can be resolved or other alternatives established.

c. The RRCG shall use facility and interface accommodations provided by the SSCC for ROS command and control backup equipment, which is part of the RGS provided by RSA and located in the SSCC.

E3.7.2.3.2.5 Support Groups

a. The RGS shall provide the capability to support RRCG operations for ROS systems monitoring from RGS equipment provided by RSA and located in the SSCC.

b. The RRSG shall use facility and interface accommodations provided by the SSCC for RGS command and control equipment provided by RSA and located in the SSCC.

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E3.7.2.3.3 Provide data for uplink.

E3.7.2.3.3.1 Acquire data for uplink.

The RGS shall provide for the acquisition of data intended for uplink from sources both internal and external to the RGS.

AGREED.

E3.7.2.3.3.2 Transfer data intended for station.

The RGS shall provide for the transfer of data within the RGS which is intended for uplink.

AGREED.

E3.7.2.3.3.3 Prepare data for uplink to on–orbit station.

The RGS shall provide for uplink to the on–orbit space station.

AGREED.

E3.7.2.3.3.4 Transmit data for uplink.

The RGS shall transmit data intended for uplink through the Russian communications system.

AGREED.

E3.7.2.3.3.5 Automated Rendezvous and Docking (AR&D) uplink support.

The RGS shall provide to the Russian external vehicles that are rendezvousing with the ISSA the following information:

a. Targeting for the maneuvers Delta Velocity (DV)1, DV2, and DV3.

b. Latest available state vector information for the ISSA and for the external vehicle.

AGREED.

E3.7.2.3.3.6 Automated Rendezvous and Docking (AR&D) downlink support.

The RGS shall provide for the capability to process and display full downlink telemetry data nd TV link data when the data is available.

AGREED.

E3.7.2.3.4 Support downlinked data.

E3.7.2.3.4.1 Receive downlinked data.

a. The RGS shall provide for the receipt of data from the Russian Elements/payloads through the Russian communications system or through the USGS.

b. The RGS shall provide for the capability to receive downlink data from the USOS through the on–orbit Russian Elements and the Russian communications system.

AGREED.

E3.7.2.3.4.2 Prepare downlinked data for ground use.

The RGS shall provide for the demultiplexing and conversion of ISSA audio, video, systems telemetry and payload data.

AGREED.

E3.7.2.3.4.3 Reserved.

E3.7.2.3.4.4 Record downlinked data.

The RGS shall provide for the recording of audio, video, systems telemetry, and payload data, which is downlinked from ROS and via ROS.

AGREED.

E3.7.2.3.4.5 Reserved.

E3.7.2.3.4.6 Playback recorded flight–ground data.

The RGS shall provide for the playback of recorded ISSA audio, video, systems telemetry, and payload data.

AGREED.

E3.7.2.3.4.7 Distribute data on ground.

a. The RGS shall provide for the distribution of ISSA audio, video, systems telemetry and payload data to destinations both internal and external to the RGS.

b. The RGS distribution of communications data shall be in accordance with formats described in SSP TBD ICD.

AGREED.

E3.7.2.3.5 Training.

E3.7.2.3.5.1 Basic training.

The RS shall support the preparation and conduct of basic training for newly selected crew members, ground controllers and instructors in the applicable areas of: fundamentals of spacecraft systems and operation (Shuttle, Soyuz, and ISSA), basic science, and survival training.

AGREED.

E3.7.2.3.5.2 Advanced training.

The RS shall support the preparation and conduct of advanced training for crews, ground controllers, and instructors in the applicable areas of: spacecraft systems and operation (Shuttle, Soyuz, and ISSA), payload operations, and training as a member of a group.

AGREED.

E3.7.2.3.5.3 Increment specific training.

The RS shall support the preparation and conduct of increment specific training for crews, ground controllers, and instructors.

The RS shall support the preparation and conduct of whole station training for crews, ground controllers, and instructors.

AGREED.

E3.7.2.3.5.4 Proficiency training.

The RS shall support the preparation and conduct of proficiency training for crews, ground controllers, and instructors.

AGREED.

E3.7.2.3.5.5 Onboard training.

The RS shall support the preparation and conduct of onboard training for crews in the applicable areas of: proficiency in spacecraft systems and payloads (Soyuz and ISSA on–orbit Russian segment), maintenance, and procedure updates.

AGREED.

E3.7.2.3.6 Reserved.

E3.7.2.3.6.1 Reserved.

E3.7.2.3.6.2 Reserved.

E3.7.2.3.6.3 Reserved.

E3.7.2.3.6.4 Reserved.

E3.7.2.3.7 Reserved.

E3.7.2.3.7.1 Reserved.

E3.7.2.3.7.2 Reserved.

E3.7.2.3.8 Develop increment operations planning products.

E3.7.2.3.8.1 Support integration of increment operations planning products.

The RGS shall support the integration of station/payload on–orbit/ground operations planning products. The RGS shall interface with the NASA Integrated Planning System in accordance with SSP TBD ICD.

AGREED.

E3.7.2.3.8.2 Develop tactical increment planning products.

The RGS shall provide for development of RS station/payload on–orbit/ground operations planning products.

AGREED.

E3.7.2.3.9 Develop weekly planning products.

E3.7.2.3.9.1 Develop user weekly operations planning products.

The RGS shall provide for development of payload on–orbit/ground weekly planning products.

AGREED.

E3.7.2.3.9.2 Develop station weekly operations planning products.

The RGS shall provide for development of station on–orbit/ground weekly planning products.

AGREED.

E3.7.2.3.9.3 Develop integrated weekly operations planning products.

The RGS shall provide for integration of station/payload on–orbit/ground weekly planning products. The RGS shall interface with the NASA Integrated Planning System for weekly planning data support in accordance with SSP TBD ICD.

AGREED.

E3.7.2.3.10 Perform real time planning support.

E3.7.2.3.10.1 Perform user payload operations realtime planning support.

The RGS shall provide for the real–time planning of ROS payload on–orbit/ground operations in response to user, crew, and MCC–M controller requirements.

AGREED.

E3.7.2.3.10.2 Perform station operations real time planning support.

The RGS shall provide for the real–time planning of ROS elements on–orbit/ground operations in response to user, crew, and MCC–M controller requirements.

AGREED.

E3.7.2.3.10.3 Perform integrated real–time planning support.

The RGS shall interface with the NASA Integrated Planning System for integrated real–time planning data support in accordance with SSP TBD ICD.

AGREED.

E3.7.2.3.10.4 Planning Systems Backup Support

a. The RGS shall provide a backup capability to support planning for ROS core systems from RGS planning equipment provided by RSA and located in the SSCC.

b. Planning support for ROS core system operations shall be sustainable from the backup planning capability in the SSCC until the problem causing backup control to be invoked can be resolved or other alternatives established.

c. The RRCG shall use facility and interface accommodations provided by the SSCC for RGS backup planning equipment provided by RSA and located in the SSCC.

E3.7.2.3.10.5 Support Group Planning

a. The RGS shall provide the capability to support ROS planning for backup control from RGS equipment provided by RSA and located in the SSCC for use by the RRCG.

b. The RRCG shall use facility and interface accommodations provided by the SSCC for RGS planning equipment provided by RSA and located in the SSCC.

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E3.7.2.3.11 Develop procedures.

E3.7.2.3.11.1 Create procedures.

The RGS shall create procedures for ground, on–orbit automated, and on–orbit manual operations.

AGREED.

E3.7.2.3.11.2 Validate procedures.

The RGS shall support validation of the procedures developed to perform flight and ground controller operations. The RGS shall verify software and data modifications to support increment by increment updates.

AGREED.

E3.7.2.3.11.3 Revise procedures.

The RGS shall maintain and revise ground operations procedures, on–orbit automated procedures, and on–orbit manual procedures.

AGREED.

E3.7.2.3.11.4 Procedure configuration control.

The RS procedures and procedures which affect other ISSA elements shall have configuration control (including version control, change histories, and an approval process).

AGREED.

E3.7.2.3.11.5 Transfer procedures.

The RGS shall transfer procedures and TBD data to the Integrated Planning System in accordance with SSP TBD ICD.

AGREED.

E3.7.2.3.12 Year 2000 Compliance.

Individual elements and systems of the Russian Ground Segment shall be capable of supporting operations before, during, and after the transition to the year 2000.

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E3.8 Precedence.

All specifications, standards, exhibits, drawings or other documents that are referenced in this specification are hereby incorporated as cited.

E4. VERIFICATION

This section contains the verification requirements for the Russian Segment.

Verification requirements are specified in sections 4.2 and 4.3. These requirements will verify the design conforms to the entire expected range of activities and environments.

AGREED.

E4.1 General.

Tests (qualification and acceptance) performed during verification will conform to the requirements specified in NASA/RSA Joint Specifications/Standards Document for the ISSA. During environmental testing, flight–equivalent hardware will normally be used to avoid subjecting the actual flight hardware to extreme environments or wear. If flight hardware is used for environmental testing, it shall be in accordance with NASA/RSA Joint Specifications/Standards Document for the ISSA. Typically, acceptance functional testing of flight hardware will be performed at nominal operational levels. If an engineering development test (on development hardware) is intended to be used to verify flight hardware, the intent to do this must be pre–declared.

Simulators used for verification purposes require validation so that the hardware being verified can not distinguish between the simulator and the actual operational hardware/software.

AGREED.

E4.2 Verification Process.

E4.2.1 Methods.

Russian Segment verification will be conducted by one or more of several methods. Methods can be chosen based upon standard Russian practices. These methods may include: Ground (development and qualification) tests; In–flight testing; Engineering Analysis; Modeling (with a low fidelity mockup); verification on the basis of previous test results or standard use, including previous flight test results; Certification for use from previous applications (technical applicability and legal permission from the manufacturer); In–plant quality control; Acceptance Testing (testing upon delivery from manufacturer or subcontractor); and Integrated Test Facility and Launch Site testing. The above terms are intended to be used as a basis for RSA to describe verification methods utilizing standard Russian terminology.

In order to help RSA to better understand the scope and content of the US term “verification”, a short description of American verification methods is described below.

Alternatively, Russian Segment verification may chose to utilize US verification methods. These are defined as follows:

Test – this is a method whereby requirements are verified by measurement during or after the controlled application of functional and environmental stimuli. Pass or fail criteria or acceptance tolerance bands will be specified prior to conduction the test. This method ensures that the actual performance of tested equipment or systems meets or exceeds specifications.

Demonstration – this is a method used for determination of properties of an end item or component by observation of its operation or characteristics. It is used with or without special equipment or instrumentation to verify characteristics such as:

Operational performance
Human engineering features
Maintainability
Accessibility
Transportability
Built in Test/Built in Test equipment
Display data

Interface verification by demonstration will use flight hardware and software, simulators, mockups, or interface tooling.

Inspection – this is a method of verifying physical characteristics that determines compliance of the item with requirements and may use standard methods such as visuals, gauges, etc. Hardware may be inspected as follows:

Construction
Workmanship
Physical condition
Specification and/or drawing compliance

Pretest and post test inspections will be performed for all tests. Inspection may be used to confirm that ground/flight software complies with applicable coding standards.

Analysis – this is a method of verification used when flight or actual operation conditions can not be simulated adequately on the ground. It is used when it is not cost effective to test. It is also used when necessary to confirm software compliance with coding standards. The Analysis verification method can be used during the following:

Engineering analysis
Mathematical modeling
Computer simulations
Similarity assessments
Analytical assessments
Utilizes proven analytical techniques and tools

Analysis can be used to determine closure of verification activities at lower levels of assembly.

AGREED.

E4.2.2 Responsibility for verification.

Unless otherwise specified, RSA is responsible for the performance of all verification activities specified within this document. Russian verification reporting requirements are defined in SSP 54501, International Ground System Integration, Verification & Test Management Plan.

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AGREED.

E4.3 SYSTEM REQUIREMENTS

E4.3.1 System definition.

E4.3.2 Characteristics.

E4.3.2.1 Performance characteristics.

E4.3.2.1.1 State: Perform mission – habitable.

Verification requirements not applicable.

E4.3.2.1.1.1 Mode: Standard – habitable.

Verification requirements not applicable.

E4.3.2.1.1.1.1 Support on–orbit to ground communication.

E4.3.2.1.1.1.2 Capability: Provide data for uplink. (RGS)

a. No verification is required for ground equipment (Hardware [H/W] and Software [S/W]) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

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c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

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E4.3.2.1.1.1.3 Capability: Support downlinked data (RGS).

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

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c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

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E4.3.2.1.1.1.4 Support Ground Mission Operations.

E4.3.2.1.1.1.5 Capability: Support on–orbit operations.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.2.1.1.2 Mode: Proximity – habitable.

Verification requirements not applicable.

E4.3.2.1.1.2.1 Capability: Mission planning – rendezvous and docking.

E4.3.2.1.2 State: Support mission.

Verification requirements not applicable.

E4.3.2.1.2.1 Mode: Ground processing.

Verification requirements not applicable.

E4.3.2.1.2.1.1 Support Prelaunch and Postlanding Operations.

Support prelaunch and postlanding operations shall be verified by analysis. The analysis shall be based on ground operations analysis, segment level qualification results and Space Station configuration data. The analysis shall be considered successful when the data shows that the planned number of flights can be accommodated.

AGREED

E4.3.2.1.2.1.2 Capability: Load/Unload cargo items.

Load/Unload cargo items shall be verified by analysis. The analysis shall be based on ground operations analysis, segment level qualification results and Space Station configuration data. The analysis shall be considered successful when it is shown that the cargo items defined can be loaded in the specified time frame.

AGREED

E4.3.2.1.2.1.3 Support system checkout and monitoring.

Support System Checkout and monitoring shall be verified by analysis. The analysis shall be based on segment level qualification results and Space Station configuration data. The results shall be considered successful when it is shown that all active systems and interfaces can be checked out prior to launch.

AGREED

E4.3.2.1.2.2 Mode: Personnel preparation.

a. No verification is required for ground equipment (HW and SW) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.2.1.2.2.1 Support personnel training.

TBD

E4.3.2.1.2.2.2 Reserved.

E4.3.2.1.2.2.3 Reserved.

E4.3.2.1.2.2.4 Reserved.

E4.3.2.1.2.3 Mode: Operations planning.

a. No verification is required for ground equipment (HW and SW) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.2.1.2.3.1 Perform increment planning.

E4.3.2.1.2.3.2 Capability: Perform resupply/return planning.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.2.1.2.3.3 Capability: Develop increment operations planning products.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.2.1.2.3.4 Capability: Develop weekly planning products.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.2.1.2.3.5 Capability: Perform real time planning support.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.2.1.2.3.6 Develop and maintain procedures.

E4.3.2.1.2.3.7 Capability: Develop procedures.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.2.1.3 Reserved

E4.3.2.1.4 Reserved

E4.3.2.1.5 Reserved

E4.3.2.1.6 Reserved

E4.3.2.1.7 Year 2000 Compliance

a. No verification is required for ground equipment Hardware (H/W) and Software (S/W) functions which have been demonstrated in previous Russian space programs or in International Space Station Alpha (ISSA) Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including United States [U.S.] ground or United States On-orbit Segment [USOS] interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

SCN 006

E4.3.2.2 Reliability.

E4.3.2.2.1 Failure Tolerance.

TBD

E4.3.3 Design and construction.

E4.3.3.1 Reserved.

E4.3.3.2 Reserved.

E4.3.3.3 Reserved.

E4.3.3.4 Reserved.

E4.3.3.5 Reserved.

E4.3.3.6 Safety.

E4.3.3.6.1 Hazardous Commands.

No verification is required.

SCN 008

E4.3.4 Computer resource requirements.

E4.3.5 Logistics.

E4.3.6 Reserved.

E4.3.7 Characteristics of major functional elements.

E4.3.7.1 Soyuz Vehicle.

E4.3.7.1.1 Capabilities.

E4.3.7.1.1.1 Support crew delivery and return.

E4.3.7.1.1.1.1 Return mission.

E4.3.7.1.1.1.2 Ground support to flight operations.

E4.3.7.2 Russian ground segment.

E4.3.7.2.1 Purpose.

Verification requirements not applicable.

E4.3.7.2.2 Description.

Verification requirements not applicable.

E4.3.7.2.3 Capabilities.

E4.3.7.2.3.1 Space station system performance analysis.

E4.3.7.2.3.1.1 Analyze operations performance.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.1.2 Manage station configuration.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.1.3 Manage station resources.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.1.4 Manage station maintenance.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.1.5 Manage station systems inventory.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.2 Support on–orbit operations

E4.3.7.2.3.2.1 Monitor and assess space station operations.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.2.2 Execute on–orbit station operations.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.2.3 Execute ground operations.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.2.4 Control Center Command and Control Backup

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian Space Programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS and that do not require interfaces with the ISS elements outside of the Russian Segment shall be verified by the Russian side through stand-alone verification based on test procedures and methods commonly used in Russia.

SCN 008

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

E4.3.7.2.3.2.5 Support Groups

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian Space Programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS and that do not require interfaces with the ISS elements outside of the Russian Segment shall be verified by the Russian side through stand-alone verification based on test procedures and methods commonly used in Russia.

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

SCN 008

E4.3.7.2.3.3 Provide data for uplink.

E4.3.7.2.3.3.1 Acquire data for uplink.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.3.2 Transfer data intended for station.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.3.3 Prepare data for uplink to on–orbit station.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.3.4 Transmit data for uplink.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.3.5 Automated rendezvous and docking uplink capability.

TBD

E4.3.7.2.3.3.6 Automated rendezvous and docking downlink capability.

TBD

E4.3.7.2.3.4 Support downlinked data.

E4.3.7.2.3.4.1 Receive downlinked data.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.4.2 Prepare downlinked data for ground use.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.4.3 Reserved.

E4.3.7.2.3.4.4 Record downlinked data.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.4.5 Reserved.

E4.3.7.2.3.4.6 Playback recorded flight–ground data.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.4.7 Distribute data on ground.

a. No verification is required for ground equipment (HW and SW) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.5 Training.

E4.3.7.2.3.5.1 Basic training.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.5.2 Advanced training.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.5.3 Increment specific training.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.5.4 Proficiency training.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.5.5 Onboard training.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.6 Reserved.

E4.3.7.2.3.6.1 Reserved.

E4.3.7.2.3.6.2 Reserved.

E4.3.7.2.3.6.3 Reserved.

E4.3.7.2.3.6.4 Reserved.

E4.3.7.2.3.7 Reserved.

E4.3.7.2.3.7.1 Reserved.

E4.3.7.2.3.7.2 Reserved.

E4.3.7.2.3.8 Develop increment operations planning products.

E4.3.7.2.3.8.1 Support integration of increment operations planning products.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.8.2 Develop tactical increment planning products

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in pervious Russian space programs or in ISSA Phase I (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.9 Develop weekly planning products.

E4.3.7.2.3.9.1 Develop user weekly operations planning products.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.9.2 Develop station weekly operations planning products.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.9.3 Develop integrated weekly operations planning products.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.10 Perform real–time planning support.

E4.3.7.2.3.10.1 Perform user payload operations real–time planning support.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.10.2 Perform station operations real–time planning support.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.10.3 Perform integrated real–time planning support.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.10.4 Planning Systems Backup Support

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian Space Programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS and that do not require interfaces with the ISS elements outside of the Russian Segment shall be verified by the Russian side through stand-alone verification based on test procedures and methods commonly used in Russia.

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

E4.3.7.2.3.10.5 Support Group Planning

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian Space Programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS and that do not require interfaces with the ISS elements outside of the Russian Segment shall be verified by the Russian side through stand-alone verification based on test procedures and methods commonly used in Russia.

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

SCN 008

E4.3.7.2.3.11 Develop procedures.

E4.3.7.2.3.11.1 Create procedures.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.11.2 Validate procedures.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.11.3 Revise procedures.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.11.4 Procedure configuration control.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.11.5 Transfer procedures.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.12 Year 2000 Compliance

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 006

E4.3.8 Precedence.

E5. PREPARATION FOR DELIVERY

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TABLES

FIGURES

SSP 45001 Rev. Basic	SSCC to HOSC ICD
SSP 45004 Rev. Basic	SSCC to CSA Ground Segment ICD
SSP 45011 Rev. Basic	SSCC to ESA Ground Segment ICD
SSP 45012 Rev. Basic	SSCC to NASDA Ground Segment ICD

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SSP 45024 Rev. Basic	HOSC to CSA Gateway ICD
SSP 45025 Rev. Basic	HOSC to NASDA Gateway ICD
SSP 45026 Rev. Basic	HOSC to ESA Gateway ICD
SSP 50039 Rev. Basic	SSPF to MBF ICD
SSP 50041 Rev. Basic	SSCC to MBF ICD

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SSP 50045 Rev. Basic	MBF to PSIV ICD
SSP 50046 Rev. Basic	MBF to POIC ICD
SSP 50047 Rev. Basic	PSIV to SVF ICD

SSP 50057 Rev. Basic	SSCC to RSA Ground Segment ICD
SSP 50067 Rev. Basic	SSTF to ESA Ground Segment ICD
SSP 50068 Rev. Basic	SSTF to NASDA Ground Segment ICD
SSP 50069 Rev. Basic	SSTF to RSA Ground Segment ICD
SSP 50070 Rev. Basic	SSTF to SMTF ICD
SSP 50071 Rev. Basic	SSTF to WETF ICD
SSP 50072 Rev. Basic	SSCC to SSTF ICD

SCN 008 ▉

SSP 50074 Rev. Basic	SSMTF to SSTF ICD
SSP 50077 Rev. Basic	PDSS to Generic User ICD
SSP 50078 Rev. Basic	SSCC to Generic User ICD
SSP 50079 Rev. Basic	MBF to SVF ICD

SCN 008 ▉

SSP 50081 Rev. Basic	Sustaining Engineering Facilities to MBF ICD

SSP 50082 Rev. Basic	SSCC to International Search and Rescue ICD
MSFC TBD Basic	PDSS to POIC ICD
SSP 50084 Rev. Basic	SSTF to NBL ICD
SSP 50085 Rev. Basic	MBF to SSTF ICD
SSP 50086 Rev. Basic	PSIV to PTC ICD
SSP 50087 Rev. Basic	PSIV to PICF ICD
SSP 50088 Rev. Basic	PDSS to PTC ICD
SSP 50089 Rev. Basic	MBF to ESA Ground Segment ICD
SSP 50090 Rev. Basic	PSIV to POIC ICD
SSP 50091 Rev. Basic	MBF to NASDA Ground Segment ICD
SSP 50092 Rev. Basic	MBF to CSA Ground Segment ICD
SSP 50097	SSMB to RS SW ICD **SCN 008**
SSP 50305	POIC to Generic User Interface Definition Document **SCN 007**

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111–5094.)

F2.1.2 Other Government documents, drawings, and publications.

JSC 13196 TBD	IPS Functional Subsystem (Platform Level B) Requirements
JCS 13325 TBD	SSCC Procedures Development and Control (PDAC) Subsystem Functional Requirements
JSC 13347 TBD	SSCC TCATS Maintenance, Inventory and Logistics Planning Subsystem Functional Requirements
JSC 13350 TBD	IPS Consolidated Planning System (CPS) Subsystem Functional Requirements
JSC 13419 TBD	IPS Flight Dynamics Planning and Analysis (FDPA) Subsystem Functional Requirements
JSC 13522 TBD	IPS Resource Utilization Planning and System Modeling (RUPSM) Subsystem Functional Requirements
JSC 13565 TBD	Integrated Planning System Level A Requirements
JSC 24454 TBD	Space Station Training Facility User Detailed Functional Requirements
JSC 35500 TBD	Institutional Robotics Requirements
JSC 37544 TBD	Integrated Planning System (IPS) International Space Station (ISS) Mission Operations Directorate (MOD) Avionics Reconfiguration Subsystem (IMARS) Functional Requirements **SCN 008**
JSCM 1700.D (January 1985)	NASA JSC Safety Manual
KHB 1700.7B (September 1992)	KSC Payload Ground Safety Handbook
MM 1700.4C (December 1983)	NASA MSFC Safety and Environmental Health

MSFC–PLAN–904 TBD	Cross–Functional Requirement Implementation Plan
MSFC–RQMT–1440 TBD	Generic Requirements for the Enhanced HOSC System
MSFC–SPEC–2123 TBD	PDSS Development Specification
MSFC–STD–1274, Vol. 2	MSFC HOSC Telemetry Format Standard, Volume 2
MSFC–STD–2535	MSFC HOSC Command Format Standard **SCN 007**
NHB 2410.9A (June 1993)	NASA Automated Information Security Handbook
NHB 5300.4 (3A.1) (June 1, 1986)	Requirements for Soldered Electrical Connections
NHB 5300.4 (3G) (April 1, 1985)	Requirements for Interconnecting Cables, Harnesses and Wiring
NHB 5300.4 (3H) (May 1, 1984)	Requirements for Crimping and Wire–Wrap
NHB 5300.4 (3I) (June 26, 1990)	Requirements for Printed Wiring Board
NHB 5300.4 (3J) (April 1, 1985)	Requirements for Conformal Coating and Staking of Printed Wiring Boards and Electronic Assemblies
NHB 5300.4 (3K) (January 7, 1985)	Design Requirements for Rigid Printed Wiring Board and Assemblies
OD–13 TBD	PTC Requirements Document
S683–35451 TBD	Payload Software Integration and Verification Prime Item Development Specification

SW683–70256–1 TBD	Payload Planning System Software Product Document System Specification
S684–10141 TBD	Prime Item Development Specification – Mission Build Facility

F2.2 Non–Government documents.

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of a conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

ANSI–S3.2–1989	American National Standards Method for Measuring The (Section 8.6) Intelligibility Of Speech Over Communications Systems

(Non–Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

F2.3 Order of precedence.

In the event of a conflict between the text of this specification and the references cited herein, the text of this specification takes precedence. Nothing in this specification, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

F3.1.5.1.5.3.1 Payload Data.

F3.1.5.1.5.3.1.1 PDSS shall provide the capability to receive the ISS Ku–Band downlink stream, extract Japanese payload data, JEM partner payload health and status data, and shall distribute it to SSIPC in real–time.

F3.1.5.1.5.3.1.2 PDSS shall provide the capability to receive SSIPC requests for stored Japanese payload data, JEM partner payload health and status, and provide to SSIPC.

F3.1.5.1.5.3.2 Ground Audio/Video.

F3.1.5.1.5.3.2.1 POIC and SSIPC shall provide a video data communications function for video conference between the POIC and SSIPC.

F3.1.5.1.5.3.2.2 POIC and SSIPC shall provide the talk/monitor capability on POIC/PDSS ground voice loops.

F3.1.5.1.5.3.3 Operations Data.

POIC shall provide the capability to receive/transmit operations execution data with the SSIPC.

SCN 002

F3.1.5.1.6 Russian Ground Segment external interface description.

The RGS interfaces with the USGS. This interface supports USOS and ROS command and telemetry transfer and other ground mission operations functions. In addition to routine planned support for prelaunch, launch, on–orbit, and training operations, this interface includes data transfers necessary to support the following:

a. Control Center Backup – Interface support for SSCC to backup essential functions of MCC–M and the MCC–M to backup essential functions of the SSCC.

b. Support Groups – Support for the HSG in the MCC–M and the RRCG in the SSCC.

The interface includes two–way exchange of ground control and coordination functions including the following: communications (data, voice, video, and files); operational planning products and data (ISS systems and payloads); training data; logistics support coordination data; launch services coordination data; and engineering support data regarding Russian hardware, software, payloads, and activities. The USGS to RGS control center interfaces are defined in SSP 50057. Training Facility interfaces are defined in SSP 50069.

SCN 008

The USGS can interface with the USOS via the RGS and ROS. Likewise, the RGS can interface with the ROS via the USGS and USOS. This interface supports commanding and telemetry with either the RGS or USGS. All commands and data transferred between the USOS and the ROS shall be in accordance with SSP 50097. The capabilities of the RGS interface with the USOS via the ROS, and the USGS interface to the ROS through the USOS are limited to the capabilities in SSP 50097.

SCN 008

F3.1.5.1.7 Space Station Processing Facility external interface description.

The USGS (the MBF) will interface with the Space Station Processing Facility (SSPF) to provide on–orbit ISS core MDM software loads in support of ground processing and testing. The SSPF will also interface with the USGS for the receipt of resupply return plans consisting of detailed resupply return manifests, logistics carrier loading plans, and launch vehicle loading plans. The SSPF interface is defined in ICD SSP 50039.

F3.1.5.1.8 Software Verification Facility external interface description.

The Software Verification Facility (SVF) will interface with the USGS to provide on–orbit ISS core MDM software loads in support of ground testing. The SVF will also interface with the USGS to provide test results and anomaly reports as produced from the final software verification process. This interface is defined in SSP 50079, MBF to SVF ICD.

F3.1.5.1.9 Shuttle Mission Training Facility external interface description.

The Shuttle Mission Training Facility (SMTF) will interface with the USGS (SSTF) to exchange simulation data and audio in support of shuttle–to–station coordination training. The USGS to SMTF interface is defined in ICD SSP 50070.

F3.1.5.1.10 Sustaining engineering facilities external interface description.

Sustaining engineering facilities will interface with the USGS to exchange data in support of systems performance analysis and to provide system flight software updates. The USGS to sustaining engineering facilities interface is defined in SSP 50081, Sustaining Engineering Facilities to MBF ICD.

SCN 008

F3.1.5.1.11 International Search And Rescue external interface description.

The SSCC to international search and rescue interface provides audio communication required for coordination of search and rescue operations in support of Crew Return Vehicle (CRV) operations.

SCN 008

F3.1.5.1.12 Weightless Environment Training Facility external interface description.

The USGS (SSTF) to Weightless Environment Training Facility (WETF) interface provides training audio and video in support of training for ISS operations. The USGS to WETF interface is provided by ICD SSP 50071.

F3.1.5.2 Internal interfaces.

The interfaces which are within the USGS are defined in the following subparagraphs. The USGS internal interfaces are shown in Figure F–1. A description of the types of information identified in the figure is discussed in paragraph 3.1.5.1.

F3.1.5.2.1 SSCC to HOSC internal interface description.

The SSCC to HOSC (POIC) interface provides for the exchange of planning data, payload commands, command responses, data from SSCC, Space Station video to POIC, audio to/from SSCC, and audio to/from the Space Station crew. This interface is defined in ICD SSP 45001.

F3.1.5.2.2 SSCC to MBF internal interface description.

The MBF provides system flight software and system data loads to the SSCC for use within the SSCC or for uplink to the on–orbit Space Station. This interface is defined in ICD SSP 50041.

F3.1.5.2.3 SSCC to SSTF internal interface description.

The SSCC provides simulation command uplink data and audio to the SSTF and receives simulation audio, video, and data from the SSTF. This interface is defined in ICD JSC 11534 Vol II.

F3.1.5.2.4 PDSS to POIC internal interface description.

The PDSS provides payload S–band and Ku–band data to the POIC from NASCOM. This interface is defined in ICD MSFC TBD.

F3.1.5.2.5 Reserved.

SCN 008

F3.1.5.2.6 SSTF to NBL internal interface description.

The NBL provides video and audio to the SSTF and receives audio from the SSTF to support training. This interface is defined in ICD SSP 50084 ICD.

F3.1.5.2.7 SSTF to SSMTF internal interface description.

The SSMTF provides the SSTF with simulated audio and video to support training. This interface is defined in ICD SSP 50074.

F3.1.5.2.8 MBF to POIC internal interface description.

The MBF provides the POIC with flight command and telemetry database definitions. The POIC provides the MBF with discrepancy reports regarding flight command and telemetry database definition errors. This interface is defined in ICD SSP 50046.

F3.1.5.2.9 MBF to SSTF internal interface description.

The MBF to SSTF interface provides the SSTF with flight software products to support training. This interface is defined in ICD SSP 50085.

F3.1.5.2.10 MBF to PSIV internal interface description.

The MBF to PSIV interface provides the MBF with payload related flight products to support station flight load builds and final station data files generation. This interface also provides the PSIV with system configuration products and data to support payload software integration testing. This interface is defined in ICD SSP 50045.

F3.1.5.2.11 PSIV to PTC internal interface description.

The PSIV to PTC interface provides the PTC with payload flight data products to support flight crew training. This interface is defined in ICD SSP 50086.

F3.1.5.2.12 PSIV to PICF internal interface description.

The PSIV to PICF interface provides the PICF with payload flight data products. This interface is defined in ICD SSP 50087.

F3.1.5.2.13 Reserved.

SCN 008

F3.1.5.2.14 PDSS to PTC internal interface description.

The PDSS to PTC interface provides simulated payload training health and status data for operations training. This interface is defined in ICD SSP 50088.

F3.1.6 Government Furnished Material.

NA

F3.2 Characteristics.

F3.2.1 Performance characteristics.

F3.2.1.1 Perform ground mission operations.

F3.2.1.1.1 Space Station system performance analysis.

The purpose of this capability is to perform the analyses necessary to support the ISS.

A. The USGS shall provide the capability to analyze on–orbit and ground systems performance to determine if these systems are performing within expected operational limits and design characteristics.

B. The USGS shall provide the capability to manage the configuration, resources, maintenance and inventory of the ISS system to ensure on–board resources are utilized according to the defined plans.

C. The USGS shall provide the capability to support both manual and automatic detection, isolation, and recovery of on–orbit systems faults.

SCN 004

F3.2.1.1.2 Support on–orbit operations.

The purpose of this capability is to support on–orbit operations of ISS systems and payloads.

A. The USGS shall provide the capability to monitor the status and performance of on–orbit systems and user payloads during execution of on–orbit operations and evaluate the success of the operations with respect to defined plans.

B. The USGS shall provide the capability to execute planned and alternative on–orbit and ground operations.

C. The USGS shall have the capability to coordinate on–orbit ISS and user payload command and control operations.

D. The USGS shall have the capability to coordinate station and user payload ground operations activities.

E. The USGS shall provide the capability to control access to, configure, and coordinate utilization of uplink and downlink communications between the on–orbit Space Station and the ground.

and regulations as cited within those NASA documents, and will be defined in each of the end item specifications.

F3.3.6.3 Hazardous Commands.

The United States ground systems shall support the ground–based commanding of the on–orbit elements in a safe and nonhazardous manner. This shall include positive control of hazardous commands.

SCN 008

F3.3.7 Reserved.

F3.3.8 Reserved.

F3.3.9 System security.

A. The space station shall support privacy for audio communications on the uplink/downlink.

B. The space station shall provide protection for uplinked commands to prevent unauthorized third party control of the on–orbit station.

SCN 004

F3.4 Computer resource requirements.

NA

SCN 004

F3.5 Logistics.

NA

SCN 004

F3.5.1 Maintenance.

A. The design goal for the return of ground based systems to an operational capability shall be by the removal and replacement of LRUs from their installed locations.

B. When LRU removal and replacement is not applicable, end item functionality may be restored by in–situ maintenance.

C. USGS preventive maintenance shall be permitted to retain ground system functionality.

SCN 004

F3.6 Personnel and training.

F3.6.1 Personnel.

NA

SCN 004

F3.6.2 Training.

The USGS shall provide mockups, part task trainers, full task trainers, simulators, printed material, video media and other training aids to ensure that equipment operators and crew personnel have the required skills to operate and maintain the ISS.

F3.7 Characteristics of major functional elements.

F3.7.1 Space Station Control Center (SSCC).

F3.7.1.1 Purpose.

The role of the SSCC is to provide the exclusive command and control authority for the overall safe operation of the station. The SSCC will provide activity planning, procedure development, logistics support, systems modeling and resource utilization monitoring and maneuver planning.

F3.7.1.2 Description.

The SSCC is part of the Mission Control Center–Houston at the Johnson Space Center. The Flight Control Rooms (FCR) provide a central operational center for key managers and flight controllers. Multi–purpose Support Rooms (MPSR) provide additional capacity for system experts to support the mission. Communication interfaces provide connectivity to the TDRSS ground terminal for Station space–ground data links and ground–ground interfaces are provided to the POIC, IPs, RSA, training facilities and other required locations. SSCC data systems provide processing of uplink commands and downlink telemetry, provide recording, archive and retrieval, and provide for Space–Ground and Ground–Ground voice and video. Expert systems are provided to allow the flight controller control and monitor capabilities and to automate functions.

F3.7.1.3 Space Station system performance analysis.

F3.7.1.3.1 Analyze operations performance.

A. The SSCC shall provide the capability to analyze the performance of on–orbit operations relative to predetermined limits and expected performance.

B. The SSCC shall provide the capability to trend on–orbit operations performance data.

C. The SSCC shall provide the capability to track anomalies, determine causes and support development of recommendations for restoring systems to expected performance.

F3.7.1.3.2 Manage station configuration.

A. The SSCC shall maintain the on–orbit hardware and software configuration status and history.

B. The SSCC shall support CM of the manned base, on–board configuration products and maintain a complete and updated status of the on–board software and data configuration.

F3.7.1.3.3 Manage station resources.

The SSCC shall provide the capability to manage on–orbit station resources.

F3.7.1.3.4 Manage station maintenance.

The SSCC shall provide the capability to manage maintenance of the on–orbit station.

F3.7.1.3.5 Manage station inventory.

The SSCC shall provide the capability to track and coordinate on–orbit station inventory.

F3.7.1.4 Support on–orbit operations.

F3.7.1.4.1 Monitor and assess station system operations.

A. The SSCC shall provide the capability to monitor and display the operational status and performance of the Station systems.

B. The SSCC shall provide the capability to compare on–orbit station operations with projected performance.

C. The SSCC shall provide the capability to determine the planned and alternative operations to be performed.

D. The SSCC shall monitor and control space station on–board safety inhibits (interlocks) of operations determined to be hazardous.

E. The SSCC shall provide the capability for real–time dedicated displays of robotic systems status, kinematic graphic visualizations, and video images.

F3.7.1.4.2 Execute on–orbit station operations.

A. The SSCC shall provide the capability to command on–orbit ISS operations.

B. The SSCC shall provide for the generation of commands and data tables for uplink to the on–orbit ISS in accordance with ICD SSP 41154.

C. The SSCC shall provide for audio communications between flight crew and ground controller personnel in support of on–orbit ISS operations in accordance with ICD SSP 42105.

D. The SSCC shall provide for the processing of downlink data from the on–orbit ISS in accordance with ICD SSP 41154.

E. The SSCC video function shall support processing of the Ku–band video data downlink in accordance with ICD SSP 42104.

F. The SSCC command path components shall be monitored for failures.

G. The SSCC shall check for data corruption when retrieving commands from internal and external storage.

SCN 008

H. The SSCC shall alert operators when “safed” commands are presented for uplink and shall allow operators to manually “unsafe” the command to enable uplink.

I. The SSCC command processing shall ensure that a command cannot be uplinked while “safed”.

J. The SSCC shall accommodate international partners (IP) in commanding of the partner on–orbit elements, the return of associated telemetry, and the coordination of IP planning, training, simulation audio and video, software loads and procedure data.

K. All hazardous commands must be identified in an SSCC command database.

L. The SSCC shall provide for identification of hazardous commands destined for uplink based upon safety data input definitions from the data source.

M. The SSCC shall cease commanding when failure is detected in a command path component until such time that the failure is either resolved or a substitute component is brought online.

N. The SSCC shall be capable of identifying hazardous commands embedded within multiple command strings and prevent transmission for uplink until “unsafed.”

O. The SSCC shall ensure command data integrity throughout command path.

SCN 008

F3.7.1.4.3 Execute ground operations.

A. The SSCC shall provide the ground–to–ground audio communications required to support ground operations coordination for on–orbit station operations.

B. The SSCC shall provide the capability to schedule and control ground systems and communications systems supporting on–orbit ISS operations.

C. The SSCC shall provide the capability to receive, manipulate, and process trajectory data to determine the orbit for three (3) vehicles being tracked in support of the Space Station operations.

D. The SSCC video function shall support ground–to–ground video teleconferencing.

E. The SSCC shall provide private communications and mechanisms to prevent unauthorized access to ISS voice communications.

F. The SSCC shall provide ground–to–ground audio communications required to coordinate the search and rescue operations in support of CRV operations for landings in regions outside the Russian Segment operations area.

SCN 008

F3.7.1.4.4 Mission Control Center Command and Control Backup.

A. The SSCC shall provide the capability to support backup operations for command and control of the USOS core systems from equipment, which is part of the SSCC provided by NASA and located in MCC–M, utilizing RGS and ROS communication assets.

B. A minimum of one week of USOS core system operations shall be sustainable from the backup SSCC capability in the MCC–M.

C. The HSG shall use facility and interface accommodations provided by the RGS for USOS command and control backup equipment provided by NASA and located in the MCC–M utilizing RGS and ROS communication assets.

F3.7.1.4.5 Support Groups.

A. The SSCC shall provide the capability to support HSG operations for USOS systems monitoring from SSCC equipment provided by NASA and located in the MCC–M.

B. The HSG shall use facility and interface accommodations provided by the RGS for USOS command and control equipment that is part of the SSCC provided by NASA and located in the MCC–M.

SCN 008

F3.7.1.5 Provide data for uplink.

F3.7.1.5.1 Acquire data for uplink.

A. The SSCC shall provide for the acquisition of data intended for uplink from sources both internal and external to the SSCC in accordance with the ICDs SSP 45001 (HOSC), SSP 45004 (CSA), SSP 45011 (ESA), SSP 45012 (NASDA), SSP 50041 (MBF) and SSP 50057 (RSA).

B. The SSCC shall provide the capability to generate command data and initiate command uplinks for all Space Station elements as stated in ICD SSP 41154.

C. The SSCC shall receive electronic data files in accordance with ICDs SSP 42018, 41154, 45004, 45011, 45012, 50059, 45001, 50041, and 50057.

F3.7.1.5.2 Transfer data intended for on–orbit space station.

The SSCC shall provide the capability to transfer data intended for uplink within the SSCC.

F3.7.1.5.3 Prepare data for uplink to on–orbit station.

A. The SSCC shall prepare data for uplink to the on–orbit Space Station in accordance with ICDs SSP 41154, 42018, 42104, 42105, and 50072.

B. The SSCC shall provide encryption of the Space Station uplink in accordance with SSP 42018.

F3.7.1.5.4 Transmit data for uplink.

A. The SSCC shall transmit data intended for uplink to the Ground Communication System external interface in accordance with ICDs SSP 41154, 42104, 42018, 42105 and 50072.

B. The SSCC shall provide the capability to monitor core command content and restrict core and payload command sources.

C. The SSCC shall record the uplink commands.

D. The SSCC shall provide command uplink metering as specified in SSP 41154.

E. Delay between the time of command initiation at the command position and that command exiting the SSCC shall be no greater than one second for core and payload commands (after receipt by the SSCC).

F3.7.1.6 Support downlinked data.

F3.7.1.6.1 Receive downlinked data.

A. The SSCC shall receive S–band and Ku–band data from the Ground Communications System external interface in accordance with ICDs SSP 41154, 41158, 42018, 42104, 42105 and 50072.

B. The SSCC shall provide the capability to monitor the quality of systems and payload safety telemetry data.

F3.7.1.6.2 Prepare downlinked data for ground use.

A. The SSCC shall provide demultiplexing and conversion of audio, systems telemetry, payload safety data, and video.

B. The SSCC shall process Space Station core systems telemetry.

C. The SSCC shall process Space Station payload safety data.

D. The SSCC shall perform Engineering Unit(s) (EU) conversion.

E. The SSCC shall make incoming telemetry data available for display at user positions within five seconds of SSCC receipt.

F3.7.1.6.3 Convert data for external ground interfaces.

The SSCC shall provide the capability for the conversion of systems telemetry, payload safety data, audio, and video data into a form compatible with external interfaces to the SSCC as specified in ICDs SSP 45001 (HOSC), SSP 45004 (CSA), SSP 45011 (ESA), SSP 45012 (NASDA), SSP 50041 (MBF) and SSP 50057 (RSA).

F3.7.1.6.4 Record downlinked data.

A. The SSCC shall provide the capability for the recording of the S–band and Ku–band systems telemetry, payload safety data, audio, and video data.

B. The SSCC shall record tracking data for storage and retrieval.

F3.7.1.6.5 Archive recorded flight–ground data.

The SSCC shall provide the capability to archive systems telemetry, payload safety data, audio, and video.

F3.7.1.6.6 Playback recorded flight–ground data.

A. The SSCC shall retrieve recorded or archived S–band and Ku–band systems telemetry, payload safety data, audio, and video.

B. The SSCC shall provide the capability to simultaneously record, store, and playback flight vehicle analog video and JSC–originated video data.

F3.7.1.6.7 Distribute data on ground.

A. The SSCC shall provide for the distribution of systems telemetry, payload safety data, audio, and video to destinations both internal and external to the SSCC as specified in ICDs SSP 45001 (HOSC), SSP 45004 (CSA), SSP 45011 (ESA), SSP 45012 (NASDA), SSP 50041 (MBF) and SSP 50057 (RSA).

B. User specified space vehicle processed telemetry data shall be output in real–time to remote users.

C. The SSCC video distribution system shall support real time and simulation downlink video, SSCC generated and JSC–originated video, externally generated NTSC TV (e.g., launch/landing TV, commercial TV, weather, weather radar, etc.) and Public Affairs Office (PAO) TV.

F3.7.1.7 Perform task training.

F3.7.1.7.1 Perform Space Station task training.

The SSCC shall provide capability to conduct system task training including on–the–job training, console tool training, and playback training for SSCC controllers.

F3.7.1.8 Perform function training.

F3.7.1.8.1 Perform Space Station functional training.

A. The SSCC shall provide connectivity to SSTF, SSMTF, and WETF/NBL as defined below to support function training including on–the–job training, and integrated training.

B. The SSCC shall provide uplink data and audio to the SSTF and shall receive audio, simulated downlink data and video from the SSTF in accordance with ICD SSP 50072.

C. The SSCC shall maintain separation between simulation or training data, and real–time operations data.

D. The SSCC shall be capable of performing real time operations concurrent with simulations.

E. The SSCC shall provide audio to the SSMTF and WETF/NBL, and shall receive audio and video from the SSMTF.

F3.7.1.9 Perform operations training.

F3.7.1.9.1 Perform NASA operations training.

A. The SSCC shall provide connectivity to POIC/PDSS, SSTF, SSMTF, and WETF/NBL to support operations training.

B. The SSCC shall provide uplink data and audio to the SSTF and shall receive audio, simulated downlink data and video from the SSTF in accordance with ICD SSP 50072..

C. The SSCC shall be capable of performing real time operations concurrent with simulations.

D. The SSCC shall provide audio to the SSMTF and WETF/NBL, and shall receive audio and video from the SSMTF and WETF/NBL.

F3.7.1.9.2 Perform International Partner operations training.

A. The SSCC shall provide connectivity to IP facilities to support operations training. (These interfaces are defined in ICDs SSP 45004 (CSA), SSP 45011 (ESA), SSP 45012 (NASDA) and SSP 50057 (RSA)

B. The SSCC shall provide IP originated uplink data and audio to the SSTF and shall transfer audio and simulated downlink data from the SSTF to the IP in accordance with IRDs SSP 45004 (CSA), SSP 45011 (ESA), and SSP 45012 (NASDA).

C. The SSCC shall be capable of performing real time operations concurrent with simulations.

F3.7.2 Payload Operations Integration Center (POIC).

F3.7.2.1 Purpose.

The POIC is the primary facility for managing the execution of on–orbit payload operations.

F3.7.2.2 Description.

The POIC is designed to provide a generic set of services required to support Space Station payload operations including telemetry processing of the Payload Health and Status data, the core systems data as well as ground–generated test and simulation telemetry. Uplink command processing services provided are for POIC operation of payload support systems. The POIC provides for development, storage and delivery of payload operations procedures, and generation of ground ancillary data.

F3.7.2.3 Space Station system performance analysis.

F3.7.2.3.1 Analyze operations performance.

A. The POIC shall provide the operator tools for conducting analysis of the performance of on–orbit payload and payload support systems operations relative to predetermined limits and expected performance.

B. The POIC shall provide the tools to enable the tracking of on–orbit payload support system anomalies.

F3.7.2.3.2 Manage Station Configuration.

The POIC shall provide the tools to enable the statusing of the hardware and software configuration of payload support systems.

F3.7.2.3.3 Manage Station Resources.

The POIC shall provide the tools to enable the statusing of space station supplied and payload used resources as specified by pre–increment allocations/plans of resources for payload consumption.

F3.7.2.4 Support on–orbit operations.

F3.7.2.4.1 Monitor and assess payload operations.

A. The POIC shall provide the capability to determine the operational status of payload and payload support systems.

B. The POIC shall provide the tools for the user to conduct comparison analysis of payload and payload support systems operations status with projected operations status.

C. The POIC shall provide the tools to enable limit checking and exception monitoring of core systems data.

D. The POIC shall provide the tools to enable limit checking and exception monitoring of payload health and status data.

E. The POIC shall provide for the reception and display of payload and payload support systems caution and warning data.

F. The POIC shall display up to 4 channels of video data simultaneously.

F3.7.2.4.2 Execute payload operations.

A. The POIC shall provide the user the capability to perform ground based commanding of payloads and payload support systems operations in accordance with 3.7.2.5.1.

B. The POIC shall be able to generate payload commands and data tables compatible with SSCC integration protocols for merging of payload and core systems uplink data streams.

C. The POIC shall provide to the users the capability to initiate manual override of individual on–board command inhibits from the ground.

D. The POIC shall provide ground controllers the ability to command changes to on–board system limits.

E. The POIC shall provide users the capability to initiate ground control commands for planning product execution.

F. The POIC command path components shall be monitored for failures.

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G. The POIC shall check for data corruption when retrieving commands from internal or external storage.

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H. The POIC shall provide for safing of commands identified in the PSIV data base as hazardous (i.e. provide unique “hazardous command” identification) in a manner that will allow software to recognize the command as hazardous.

I. The POIC shall allow a designated operator to manually “unsafe” a command to enable uplink and alert operators when “safed” commands are rejected for uplink.

J. The POIC command processing shall ensure that a command cannot be uplinked while “safed”.

K. The POIC shall accommodate international partners (IP) in commanding of the partner payloads, the return of associated telemetry, and the coordination of IP planning, training, simulation audio and video, software loads and procedure data for payloads.

L. The POIC shall ensure command data integrty through the POIC and its associated Communications links.

M. The POIC shall be capable of identifying hazardous commands embedded within multiple command strings and inhibit transmission for uplink of safed hazardous commands.

N. The POIC shall cease commanding when failure is detected in a command path component until such time that the failure is either resolved or a substitute component is brought online.

O. The POIC shall inhibit transmission of all safed commands identified as hazardous including those embedded in chains or blocks.

P. No inhibited command from the POIC shall be transmitted for uplink without specific operator action.

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F3.7.2.4.3 Execute ground operations.

A. The POIC shall provide for obtaining data and procedures required for payload operations from ground facilities and data sources.

B. The POIC shall provide ground–to–ground audio communications to support integrated ground core/payload operations.

C. The POIC shall provide ground–to–ground audio communications to support integrated payload operations.

D. The POIC shall provide ground–to–ground audio communications to support integrated payload/user operations.

F3.7.2.5 Provide data for uplink.

F3.7.2.5.1 Acquire data for uplink.

The POIC shall provide for the acquisition of payload and payload support systems data from sources both internal and external to the POIC in accordance with ICDs SSP 42018, 45024, 45025, 45026, and IDD 45023

F3.7.2.5.2 Transfer data intended for on–orbit Space Station.

A. The POIC shall provide for the transfer to the SSCC (in accordance with ICD SSP 45001) of payload and payload support systems data intended for uplink from sources both internal and external to the POIC.

B. The POIC shall provide for the transfer to the SSCC of planning products for the on–orbit space station.

C. The POIC shall verify that only authorized user payload commands are transmitted to the SSCC for uplink to the on–orbit station or payload.

D. The POIC shall verify that only authorized hazardous commands are transmitted to the SSCC for uplink to the on–orbit station or payload.

E. The POIC shall provide for the transfer of files to the SSCC for uplink to the on–orbit space station or payload.

F3.7.2.6 Support Downlink Data.

F3.7.2.6.1 Receive Downlink Data.

A. The POIC shall receive core systems, flight ancillary, and payload health and status telemetry in accordance with ICDs SSP 41154, 41158, 42018.

B. The POIC shall receive audio and video from the SSCC in accordance with ICD SSP 45001.

C. The POIC shall monitor received telemetry data quality.

D. The POIC shall receive up to 192 kbps of S–band core systems data for monitoring and display to the ground controllers.

E. The POIC shall receive up to 256 kbps of Ku–band payload health and status data for monitoring and display to the ground controllers.

F. The POIC shall receive up to 4 channels of video data simultaneously.

F3.7.2.6.2 Prepare downlinked data for ground use.

A. The POIC shall process core telemetry, payload health and status data, and flight ancillary data for internal distribution.

B. The POIC shall process up to 192 kbps of core telemetry data for monitoring and display to ground controllers.

C. The POIC shall process up to 256 kbps of payload health and status data for monitoring and display to ground controllers.

D. The POIC shall process payload health and status data formatted in accordance with MSFC–STD–1274, Vol. 2, MSFC HOSC Telemetry Format Standard Volume 2.

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F3.7.2.6.3 Convert data for external ground interfaces.

The POIC shall provide for the generation of ground ancillary data.

F3.7.2.6.4 Distribute data on ground.

A.. The POIC shall provide for the distribution of payload commands, simulated payload commands, planning data, and audio to destinations both internal and external to the POIC as specified in the applicable ICD SSP 45001.

B. The POIC shall provide for the distribution of ground ancillary data to the PDSS in accordance with SSP 50083 ICD.

F3.7.2.6.5 Record downlinked data.

A. The POIC shall provide for the recording of core systems, flight ancillary, and payload health and status telemetry and maintain the recording for a minimum of one week.

B. The POIC shall provide for recording of audio and video and maintain the recording for a minimum of two weeks.

F3.7.2.6.6 Playback recorded flight–ground data.

The POIC shall provide for playback of recorded core systems, flight ancillary, and payload health and status telemetry.

F3.7.2.7 Perform task training.

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F3.7.2.8 Perform function training.

F3.7.2.8.1 Perform payloads functional training.

A. The POIC shall provide for the conduct of payload functional training.

B. The POIC shall provide for simultaneous payload operations and payload functional training activities

C. The POIC shall maintain separation between payload operations and functional training command and telemetry data.

F3.7.2.9 Perform operations training.

F3.7.2.9.1 Perform NASA operations training.

A. The POIC shall provide for the conduct of NASA operations training.

B. The POIC shall provide for simultaneous operations and operations training activities

C. The POIC shall maintain separation between operations and operations training command and telemetry data.

F3.7.2.10 Perform International Partner operations training.

The POIC shall provide for the conduct of International Partner operations training.

F3.7.2.11 Develop preliminary procedures.

F3.7.2.11.1 Draft preliminary procedures.

The POIC shall provide tools for the development of preliminary payload procedures for real–time ground, on–orbit automated, and on–orbit manual operations.

F3.7.2.11.2 Validate preliminary procedures.

The POIC shall provide capability for the user to validate payload procedures developed to perform flight crew and ground controller operations.

F3.7.2.11.3 Revise preliminary procedures.

The POIC shall provide for the maintenance and revision of real–time payload ground operations procedures, on–orbit automated procedures and on–orbit manual procedures.

F3.7.2.11.4 Control preliminary procedure configuration.

The POIC shall provide for configuration control of payload ground and on–orbit operations procedures.

F3.7.2.11.5 Transfer preliminary procedures.

The POIC shall provide for the electronic receipt of preliminary user payload procedures from external sources.

F3.7.2.12 Maintain final procedures.

F3.7.2.12.1 Store final procedures.

The POIC shall provide for the storage of validated user payload final procedures and supporting data in such a way that they can be retrieved for revision, production of physical products (manuals, etc.) or transmission through the data network to users.

F3.7.2.12.2 Control final procedure configuration.

The POIC shall provide for configuration control of user payload final ground and on–orbit operations procedures.

F3.7.2.13 Deliver final procedures.

F3.7.2.13.1 Produce physical final procedure products.

The POIC shall provide the capability for the user to produce payload physical procedure products such as checklists for real–time ground operations procedures, on–orbit automated procedures, and on–orbit manual procedures.

F3.7.2.13.2 Retrieve and deliver electronic final procedure products.

A. The POIC shall provide the capability for the user to retrieve electronic payload procedure files from storage and transmit them to ground segment facilities.

B. The POIC shall provide for the transmission of flight procedure files to the SSCC for uplink.

F3.7.3 United States Operations Center (USOC).

F3.7.3.1 Purpose.

The USOC will provide users with a host payload operations location in proximity with the POIC. The USOC will provide, to users who locate there, a capability for audio, video, and limited data processing services to monitor and command their payloads. USOC users will be able to access PDSS–provided data services. They will also have access to POIC data processing and display services, as well as PPS services to support user operations planning. USOC users may also interface with another UOF or a remote user location.

F3.7.3.2 Description.

The USOC facility is in close proximity to the POIC and is designed to utilize the generic services and interfaces offered by the POIC and the PDSS. It contains user workstations, user work areas, and user conference areas in support of real–time, training and simulated operations of on–orbit payloads. The USOC provides the capability for the user to interface electronically with other appropriately equipped user operations facilities.

F3.7.3.3 Support on–orbit operations.

F3.7.3.3.1 Monitor and assess payload operations.

A. The USOC shall provide for the determination of payload operations status.

B. The USOC shall provide tools for the user to perform comparison of payload operations status with projected operations status.

C. The USOC shall display up to 4 channels of video data.

F3.7.3.3.2 Execute payload operations.

A. The USOC shall provide for ground based commanding of payload operations.

B. The USOC shall provide for the generation of payload data files for uplink to the on–orbit Space Station.

C. The USOC shall provide for audio communications between flight crew and ground controller personnel in support of payload operations.

D. The USOC shall provide the capability for the user to initiate user payload commands.

F3.7.3.3.3 Execute ground operations.

The USOC shall provide the capability for ground to ground audio communications required to provide for ground operations coordination of payload operations.

F3.7.3.4 Support downlinked data.

F3.7.3.4.1 Receive downlinked data.

A. The USOC shall receive up to 256 kbps of Ku–band payload health and status data for monitoring and display to ground controllers.

B. The USOC shall receive up to 50 Mbps of payload data for routing to user ground support equipment.

C. The USOC shall receive up to 4 channels of video data.

F3.7.3.4.2 Prepare downlinked data for ground distribution.

A. The USOC shall provide distribution of payload related data and video within the USOC.

B. The USOC shall provide the capability to process payload, experiment, and instrument data, including telemetry formatted in accordance with MSFC HOSC Telemetry Format Standard, Volume 2.

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F3.7.3.5 Perform task training.

F3.7.3.5.1 Perform payloads task training.

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F3.7.5.3.5 Manage station inventory.

A. The IPS shall provide the capability to track, coordinate, and status the on–board ISS inventory.

B. The IPS shall provide the capability to support forecasting of resupply needs and return inventory requirements.

F3.7.5.4 Support On–Orbit Operations.

F3.7.5.4.1 Monitor and Access Station System Operations.

A. The IPS shall have the capability to support ISS continuous operations with an availability of 0.98.

B. The IPS shall provide the capability to transfer the on–board operations plan to the SSCC for uplink to the on–orbit ISS.

C. The IPS shall provide the capability to transfer on–board procedures to the SSCC for uplink to the on–orbit ISS.

D. The IPS shall provide the acquisition information (e.g., AOS/LOS times, elevation angles, etc.) for ground tracking sites, for TDRS, for specified satellite targets, and for ground targets.

E. The IPS shall provide the capability for data driven graphical displays and replanning support for SSRMS robotics on–orbit operations.

F. The IPS shall provide the capability to compute on–orbit ISS mass properties and to transfer updates to the ISS, via the SSCC, to update the on–board mass properties data.

G. The IPS shall provide the capability to perform orbit lifetime analyses and to analyze ISS orbit altitude management strategies.

H. The IPS shall provide the capability to compile and control the configuration of the Systems Operations Data File (SODF) procedures required to support on–board activities.

F3.7.5.4.2 Planning Systems Backup Support

A. The IPS shall provide a backup capability to support planning for USOS core systems from IPS equipment provided by NASA and located in the MCC–M. This shall include timeline generation, flight dynamics and systems analyses, inventory tracking, and procedure generation/management.

B. A minimum of one week of planning support for USOS core system operations shall be sustainable from the backup planning capability in the MCC–M.

C. The HSG shall use facility and interface accommodations provided by the RGS for SSCC backup planning equipment provided by NASA and located in the MCC–M.

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F3.7.5.4.3 Support Group Planning

A. The IPS shall provide the capability to support USOS planning from IPS equipment provided by NASA and located in the MCC–M for use by the HSG. This shall include timeline generation, flight dynamics and systems analyses, inventory tracking, and procedure generation/management.

B. The HSG shall use facility and interface accommodations provided by the RGS for IPS planning equipment provided by NASA and located in the MCC–M.

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F3.7.5.5 Perform resupply/return planning.

F3.7.5.5.1 Define resupply/return constraints.

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F3.7.5.5.2 Define cargo item resupply/return requirements.

The IPS shall provide the capability to define and update the increment resupply/return cargo item requirements including physical data, mission priority and unique transportation requirements.

F3.7.5.5.3 Develop detailed resupply/return manifests.

The IPS shall provide the capability to support development and update of detailed resupply/return manifests for on–board crew, core systems, and payload cargo items needed by increment operations.

F3.7.5.5.4 Develop logistics carrier plans.

The IPS shall provide the capability to support the development of resupply/return load manifest requirements for on–board crew, core systems and payloads to support development and update of load plans for integrating cargo items into logistics carrier accommodations.

F3.7.5.5.5 Develop orbiter middeck loading plans.

The IPS shall have the capability to provide the resupply/return manifest requirements for on–board crew, core systems, and payloads to support development and update of load plans for integrating cargo items into the orbiter middeck.

F3.7.5.6 Develop increment operations plan.

F3.7.5.6.1 Develop station increment operations planning products.

A. The IPS shall provide the capability to develop ISS on–orbit increment operations planning products.

B. The IPS shall have the capability to simultaneously support planning for up to ten increments within the flow of the pre–increment production process.

C. The IPS shall provide the capability to support analyses of proposed plans and trade studies.

D. The IPS shall provide the capability to detect activity timeline or resource conflicts and support generation of conflict free activity timelines consistent with operational constraints.

E. The IPS shall provide the capability to develop and create the increment operations plan (IOP), the short term (weekly) plan (STP), the onboard STP (OSTP), and the STP/OSTP replan.

F. The IPS shall have the capability to automatically and interactively generate partial or complete activity timelines for ISS operations.

G. The IPS shall provide the capability to model operational constraints such as resources, temporal relationships, environmental conditions, rights, privileges, safety, and hazard constraints.

H. The IPS shall have the capability to provide attitude timelines.

I. The IPS shall provide the capability to create operations plans that may contain multiple levels of abstraction, details, or constraints.

J. The IPS shall provide the capability for manipulator systems operations planning and analysis.

K. The IPS shall provide the capability to support generation of robotics timelines.

L. The IPS shall provide the capability for electronic display and user review of operations plans during on–orbit operations.

M. The IPS shall provide for configuration management of operations plans.

N. The IPS shall store operations plans and supporting data in a manner that facilitates retrieval for revision, production of physical products, or transmission to users via electronic interfaces.

O. The IPS shall support production of physical operations planning products.

P. The IPS shall support distribution of physical operations planning products to ground controllers and flight crews.

Q. The IPS shall provide the capability to retrieve electronic operations planning files from storage for electronic delivery to ground segment users, flight controllers, and the on–orbit crew, and trainers.

F3.7.5.6.2 Develop integrated increment operations planning products.

A. The IPS shall provide for integration of inputs to the consolidated ISS operations plans and ground operations plans affecting on–orbit operations.

B. The IPS shall provide the POIC with a distribution of agreed upon ISS resources and time frames within which payload operations may be performed for integrated operations plans.

F3.7.5.6.3 Develop user payload increment operations planning products.

The IPS shall support the POIC in development of user payload increment operations plans for up to ten simultaneous increments within the flow of the pre–increment production process.

F3.7.5.7 Develop weekly planning products.

F3.7.5.7.1 Develop station weekly operations planning products.

The IPS shall provide for development of station on–orbit/ground weekly planning products.

F3.7.5.7.2 Develop integrated weekly operations planning products.

The IPS shall provide for integration of station and payload on–orbit/ground operations plans effecting on–orbit operations.

F3.7.5.7.3 Develop user payload weekly operations planning products.

The IPS shall support development of user payload on–orbit weekly planning products and ground operations plans affecting on–orbit operations.

F3.7.5.8 Perform real–time planning support.

F3.7.5.8.1 Perform station operations real–time planning support.

The IPS shall provide the capability to support real–time planning of station on–orbit/ground operations in response to user, crew, and ground controller requirements.

F3.7.5.8.2 Perform integrated real–time planning support.

The IPS shall provide for the integrated real–time planning of payload operations affecting on–orbit station operations and on–orbit station operations affecting payload operations.

F3.7.5.9 Develop preliminary procedures.

F3.7.5.9.1 Draft preliminary procedures.

A. The capability shall be provided for IPS users to draft on–orbit automated procedures, on–orbit manual operations procedures, and supporting data.

B. The IPS shall provide the capability to support generation of robotics operations procedures and supporting data.

F3.7.5.9.2 Validate preliminary procedures.

The IPS shall support validation and configuration control of procedures developed to perform flight operations.

F3.7.5.9.3 Revise preliminary procedures.

The IPS shall provide the capability to update and revise preliminary procedures including on–orbit automated procedures, on–orbit manual procedures, and supporting data.

F3.7.5.9.4 Control preliminary procedure configuration.

The IPS shall provide the capability to control the configuration of on–orbit automated procedures, on–orbit manual procedures and supporting data; these controls to include features such as write access control and viewable status information such as version ID, validity, date created, and originator.

F3.7.5.9.5 Transfer preliminary procedures.

The IPS shall have the capability to transfer preliminary procedures to the final procedure storage location.

F3.7.5.10 Maintain final procedures.

F3.7.5.10.1 Store final procedures.

The IPS shall store validated final procedures and supporting data in a manner that facilitates retrieval for revision, production of physical products (manuals, cue cards, etc.) or transmission to users via electronic interfaces.

F3.7.5.10.2 Control final procedure configuration.

The IPS shall provide the capability to control the configuration of final on–orbit automated procedures, on–orbit manual procedures, and supporting data.

F3.7.5.11 Deliver final procedures.

F3.7.5.11.1 Produce physical final procedure products.

The IPS shall provide the capability to support production of physical procedure products such as checklists for on–orbit automated procedures, and on–orbit manual procedures.

F3.7.5.11.2 Deliver physical final procedure products.

The IPS shall provide electronic copies of procedure products to enable physical delivery to ground controllers and flight crews.

F3.7.5.11.3 Retrieve and deliver electronic final procedure products.

The IPS shall provide the capability to retrieve electronic procedure files from storage for electronic delivery to ground segment users, ground controllers, on–orbit crew, and trainers.

F3.7.6 Payload Planning System (PPS).

F3.7.6.1 Purpose.

The purpose of the PPS is to automate the payload planning and scheduling process.

F3.7.6.2 Description.

The PPS is an automated software tool which is used by payload planning personnel to produce increment specific planning and execution support products. These products are used to support payload execution for an increment (pre–increment, weekly and during increment execution).

F3.7.6.3 Develop increment operations planning products.

F3.7.6.3.1 Develop integrated increment operations planning products.

The PPS shall produce the electronic integrated payload timeline for all payloads on board the station for input to IPS.

F3.7.6.3.2 Develop user payload increment operations planning products.

A. The PPS shall provide a modeling capability to collect and represent the supply and demand for constraining resources which impact the scheduling of experiment requirements.

B. The PPS shall provide a scheduling capability to produce an experiment payload execution timeline based on all modeling parameters

C. The PPS shall provide a data product generation capability to produce data products to support the payload execution planning activities for resource, data and operations control functions.

D. The PPS shall provide execution details generation and correlation capability to correlate procedures and notes to the execution of payload activities.

E. The PPS shall provide a data importing and exporting capability to import data from or export data to external sources as required to support integration of station and payload on–orbit/ground increment operations plans affecting on–orbit payload operations.

B. The TSC shall provide the capability to protect their assets in accordance with applicable government security rules and regulations, local security requirements, and the security requirements contained in SSP 50305.

C. The TSC shall satisfy the security interface requirements contained in SSP 50305.

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F3.7.19 ISS Mission Operations Directorate (MOD) Avionics Reconfiguration Subsystem (IMARS).

F3.7.19.1 Purpose.

The purpose of the IMARS is to support the MOD role in ISS avionics reconfiguration and to provide the reconfiguration data for the MOD ground facilities.

F3.7.19.2 Description

The IMARS is part of the IPS at JSC. IMARS consists of computational resources including server, workstation, and network services at JSC. IMARS includes a set of tools for user review, update, and enhancement of intermediate ISS reconfiguration data products from the MBF, receipt and storage of MBF products, report generation, product distribution, and configuration management of IMARS and MBF products used by MOD ground facilities and Government Furnished Equipment (GFE) projects. In addition, IMARS supports reconfiguration of onboard Portable Computer System (PCS) displays and ground displays.

F3.7.19.3 Provide Reconfiguration Products and Data Files.

F3.7.19.3.1 Support ISS Avionics Reconfiguration

A. The IMARS shall provide the capability to support user review and enhancement of MBF–provided telemetry and command reconfiguration data files needed to support onboard and ground operational requirements.

B. The IMARS shall return the utilization file products to the MBF in support of the Instrumentation Program and Command List process for use in creation of standard output products.

C. The IMARS shall gather, store, and configuration manage MOD–unique data for use by MOD ground facilities and GFE projects to support ISS operations.

F3.7.19.3.2 Perform Reconfiguration Product Generation

The IMARS shall provide the capability to produce reconfiguration products and reports for use by the MOD operators, MOD ground facilities, and GFE projects.

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F3.7.19.3.3 Perform Configuration Control of IMARS Input and Output Products

The IMARS shall provide a configuration–managed repository for storage and access control of input and output products, including onboard software, telemetry and command reconfiguration data, operations data, and ground facility–unique reconfiguration products.

F3.7.19.3.4 Perform Reconfiguration Product Distribution

The IMARS shall provide for access and distribution of IMARS reconfiguration products, data, and reports to MOD ground facilities and projects.

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F3.8 Precedence.

The order of precedence for the requirements paragraphs in this document is as follows:

3.2.1.x
3.7.x
3.3.x
3.2.3 through 3.2.7
3.4, 3.5.x, 3.6.x

Paragraphs 3.1.x are informational and do not contain mandatory requirements.

F4.3.3.6 Safety.

No verification required.

F4.3.3.6.1 Ground equipment.

Segment level verification not required.

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E. This requirement shall be verified by demonstration. Demonstrations shall be accomplished to verify that during EVR operations dedicated displays of robotic systems status, robotic kinematic visualizations with computer generated graphics, and robotic video i ages derived from signals and telemetry data specified in ICD SSP 41154 are displayed for the entire duration of the simulated EVR activity. The demonstration shall be performed using MRMDF simulated EVR operations, simulated downlink, and SSCC computer corresponding SSRMS, SRMS, and MSS angles, positions, and views. These will be encoded into the downlink telemetry format specified in ICD SSP 41154 which, then, the SSCC processor(s) will use to create the robotic displays in real–time. The verification is complete when it has been shown that the SSCC processor(s) display of robotic system status, kinematic graphic visualization and video images are identical to the scenario and signals generated with the simulated EVR operations, and input with the simulated downlink parameters specified in ICD SSP 41154.

F4.3.7.1.4.2 Execute on–orbit station operations.

A. This requirement shall be verified by demonstration. Demonstrations shall be accomplished by exercising the capabilities to command the station during the conduct of simulations with the SSTF. Operators using SSCC capabilities shall initiate commands to the simulated station in the SSTF. The verification is complete when it has been shown that the SSCC provides command capability to the operators on a routine basis.

B. This requirement shall be verified by test. A SSCC Data Processing–Space Station ISS C&DH software processing interface test shall be run between the SSCC and the Station Command and Data Handling system. The verification is complete when uplink data generated in the SSCC is received by the C&DH and accomplishes the intended function per SSP 41154.

C. This requirement will be verified by test. An SSCC– C&T–TDRSS interface test shall be run between the SSCC and the C&T. Two–way voice communications between the SSCC and the station C&T (crew station) shall be tested. This verification is complete when uplink and downlink voice is exchanged between the SSCC and the C&T per SSP 42105.

D. This requirement shall be verified by test. A SSCC Data Processing–Space Station ISS C&DH software processing interface test shall be run between the SSCC and the Station Command and Data Handling system. The verification is complete when representative downlink data types per ICD SSP 41154 are processed and the data displayed is consistent with scripted test values.

E. This requirement shall be verified by test. An SSCC–C&T–TDRSS interface test shall be run between the SSCC, TDRSS and the C&T. The SSCC shall process the Ku–band video data downlink. The verification is complete when video is observed in the SSCC.

F. This requirement shall be verified by analysis. An analysis of the SSCC shall be performed to identify that the end item aggregate equates to this system requirement. Analysis shall include independent hardware/software validation to establish that the hardware/software requirements have been implemented in the command system properly and that there is configuration management of control center configuration items.

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G. This requirement shall be verified by analysis. An analysis of the SSCC end item specification shall be performed to identify the end item requirements which, in their aggregate, equate to this segment requirement. A further analysis of the SSCC end item verification report shall be performed to confirm that each of the identified end item requirements have been verified. Verification shall be considered successful when it has been shown that each of the end item requirements that are derived from this segment requirement have been successfully verified.

H. This requirement shall be verified by demonstration. A demonstration shall be conducted that inputs a sequence of commands, including a random selection of hazardous commands, from the MBF. The SSCC shall attempt to uplink the command sequence to the SSTF simulated on–orbit station to confirm that the SSCC will not allow the safed commands to be uplinked but presents them to the operator for a safing/unsafing decision. Verification shall be considered successful when it has been shown that each of the randomly inserted hazardous commands are inhibited from uplink but are presented to the operator.

I. This requirement shall be verified by demonstration. A demonstration shall be conducted that inputs a sequence of commands, including a random selection of hazardous commands, from the MBF. The SSCC shall attempt to uplink the command sequence to the SSTF simulated on–orbit station to confirm that the SSCC will not allow the safed commands to be uplinked but presents them to the operator for a safing/unsafing decision. Attempts shall be made to continue with the uplink without unsafing the commands. Verification shall be considered successful when it has been shown that the SSCC inhibits uplink of the hazardous commands until unsafed by the operator.

J. This requirement shall be verified by analysis. An analysis of the SSCC end item specification shall be performed to identify the end item requirements which, in their aggregate, equate to this segment requirement. A further analysis of the SSCC end item verification report shall be performed to confirm that each of the identified end item requirements have been verified. Verification shall be considered successful when it has been shown that each of the end item requirements that are derived from this segment requirement have been successfully verified.

K. This requirement shall be verified by analysis. A list of all hazardous commands will be prepared by the hardware/software providers/integrators and provided to the operations organization. The operations organization will ensure that all hazardous commands identified on the list are specified in the database and that personnel not involved in the development of the database will check all commands in the final database against the provided list.

L. This requirement shall be verified by analysis. An analysis of the SSCC end item specification shall be performed to identify the end item requirements which, in their aggregate, equate to this segment requirement. A further analysis of the SSCC end item verification report shall be performed to confirm that each of the identified end item requirements have been verified. Verification shall be considered successful when it has been shown that each of the end item requirements derived from this segment requirement have been successfully verified.

M. This requirement shall be verified by analysis. An analysis of the SSCC end item specification shall be performed to identify the end item requirements which, in their aggregate, equate to this segment requirement. A further analysis of the SSCC end item verification report

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shall be performed to confirm that each of the identified end item requirements have been verified. Verification shall be considered successful when it has been shown that each of the end item requirements derived from this segment requirement have been successfully verified.

N. This requirement shall be verified by demonstration. A demonstration shall be conducted that inputs a multiple command string that contains a hazardous command. The SSCC shall attempt to uplink the command string to the SSTF simulated on–orbit station to confirm that the SSCC will not allow the safed command to be uplinked but presents it to the operator for a safing/unsafing decision. Verification shall be considered successful when it has been shown that the hazardous command is inhibited from uplink and is presented to the operator.

O. This requirement shall be verified by analysis. An analysis of the SSCC end item specification shall be performed to identify the end item requirements which, in their aggregate, equate to this segment requirement. A further analysis of the SSCC end item verification report shall be performed to confirm that each of the identified end item requirements have been verified. Verification shall be considered successful when it has been shown that each of the end item requirements derived from this segment requirement have been successfully verified.

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F4.3.7.1.4.3 Execute ground operations.

A. This requirement shall be verified by demonstration. Demonstrations shall be accomplished by exercising the ground–to–ground audio communications during simulations and by use in Shuttle operations. The verification is complete when it has been shown that the SSCC provides ground–to–ground audio communications for ground operations coordination on a routine basis.

B. This requirement shall be verified by test. An SSCC–C&T–TDRSS interface test shall be run between the SSCC, TDRSS and the C&T. Control of the TDRSS ground systems supporting operations shall be tested by successfully communicating with the C&T system. The verification is complete when the ground systems supporting the test communicate with the C&T system throughout a dynamic Payload scenario while exercising ground control messages.

C. This requirement shall be verified by test. The SSCC shall determine the orbit of ‘targets–of–opportunity’ including the Shuttle to verify the capability to receive, manipulate, and process trajectory data. The verification is complete when the known orbit of at least three of the targets of opportunity are compared with the derived orbits and vectors are received by other centers.

D. This requirement shall be verified by demonstration. Ground–to–ground video teleconferencing shall be exercised in the required SSCC locations. The verification is complete when it has been shown that the SSCC operators can accomplish video telecons in the required locations.

E. This requirement shall be verified by demonstration. Demonstrations exercising access control shall be accomplished during simulations with the SSTF. The verification is complete when it has been shown that communications can be observed only at the requested locations and that access is limited to the requested sources.

F. This requirement shall be verified by analysis. An analysis of the SSCC end item specification shall be performed to identify the end item requirements which, in their aggregate, equate to this segment requirement. A further analysis of the SSCC end item verification report shall be performed to confirm that each of the identified end item requirements have been verified. Verification shall be considered successful when it has been shown that each of the end item requirements that are derived from this segment requirement have been successfully verified.

F4.3.7.1.4.4 Mission Control Center Command and Control Backup

A. This requirement shall be verified by testing. A test of the backup support capabilities for command and control of the USOS core system operations from SSCC equipment located in MCC–M utilizing RGS communication assets shall be conducted with the MCC–M. The MCC–M will flow NASA–provided USOS test downlink data, and Houston Support Room (HSR) personnel shall monitor the status and performance of the USOS core systems. HSR personnel shall initiate USOS test commands to the MCC–M. Test commands will not be uplinked but shall be delogged and verified by analysis. Monitoring verification is complete when it has been shown that the SSCC equipment provides USOS data to the operators to enable the monitoring of operational status and performance of the USOS core systems. Command verification is complete when it has been shown that the SSCC equipment in the MCC–M provides operators with the capability to initiate core systems commands to the MCC–M via the RGS.

B. This requirement shall be verified by analysis. An analysis shall be conducted of the SSCC backup facility installation and testing end item qualification reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the SSCC backup capability in the MCC–M is capable of supporting a minimum of one week of USOS core system operations. (Note that a Reliability, Maintainability, and Availability (RMA) analysis of the backup facility will not be required to successfully conclude this verification.)

C. The RGS provision of facility and interface accommodations for USOS command and control backup equipment, which is part of the SSCC located in the MCC–M, shall be verified by analysis. An analysis shall be conducted of the backup facility installation and testing end item qualification reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the RGS is able to provide facility and interface accommodations for USOS command and control backup equipment that will be located in the MCC–M.

F4.3.7.1.4.5 Support Groups

A. This requirement shall be verified by testing. A test of the capability to support HSG operations for USOS systems monitoring from SSCC equipment located in the MCC–M shall be conducted with the SSCC utilizing USOS test telemetry data. HSG personnel using SSCC capabilities in the MCC–M shall monitor the status and performance of the USOS systems utilizing the test telemetry data input from the SSCC. Performance monitoring verification is complete when HSG operators confirm that the SSCC equipment provides proper display of telemetry data to the operators to enable the monitoring of operational status and performance of the USOS systems on a routine basis.

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B. The RGS provision of facility and interface accommodations for USOS command and control equipment that will be located in the MCC–M for use by HSG shall be verified by analysis. An analysis shall be conducted of the USOS command and control equipment installation and testing end item qualification reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the RGS is able to provide facility and interface accommodations for USOS command and control equipment that will be located in the MCC–M for use by HSG.

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F4.3.7.1.5 Provide data for uplink.

No verification required.

F4.3.7.1.5.1 Acquire data for uplink.

A. This requirement shall be verified by demonstration. The SSCC shall demonstrate that uplink data can be acquired from authorized sources internal to the SSCC and external sources that are specified in the ICD's identified in 3.7.1.5.1.A by accepting test messages from those sources and confirming receipt in the SSTF. The verification shall be considered successful when the SSCC operator confirms the proper display of telemetry data from the SSTF.

B. This requirement shall be verified by test. A SSCC Data Processing–Space Station ISS C&DH software processing interface test shall be run between the SSCC and the Station Command and Data Handling system. The SSCC shall initiate command uplands and generate command data. The C&DH shall confirm proper acceptance. The verification is complete when representative command types per SSP 41154 have been accepted by the SSTF C&DH.

C. This requirement shall be verified by demonstration. The SSCC shall demonstrate that electronic data files can be received and uplinked from interfaces described in the ICD's identified in 3.7.1.5.1.C. The files will be transmitted to the SSTF for error free acceptance by the C&DH system. The verification shall be considered successful when the SSCC operator confirms the proper display of telemetry data from the SSTF.

F4.3.7.1.5.2 Transfer data intended for on–orbit space station.

This requirement shall be verified by demonstration. The SSCC shall demonstrate the capability to transfer data within the SSCC which is intended for uplink by initiating a command and confirming that the command was properly received by the C&DH in the SSTF. The verification shall be considered successful when the SSCC operator confirms the proper display of telemetry data from the SSTF.

F4.3.7.1.5.3 Prepare data for uplink to on–orbit station.

A.. This requirement shall be verified by test. An SSCC Data Processing–Space Station ISS C&DH software processing interface test shall be run between the SSCC and the Station

Command and Data Handling system. The verification is complete when uplink data generated in the SSCC is received by the C&DH and accomplishes the intended function per SSP 41154.

B. This requirement shall be verified by test. An SSCC–C&T–TDRSS interface test shall be run between the SSCC, TDRSS, and the C&T. The compatibility of the SSCC encryption and the C&DH decryption function shall be tested by successfully commanding when encrypted. The verification is complete when it has been shown that the SSCC provides data to the operators to enable the determination that encrypted commands had been accepted by the SSTF per SSP 42018 on a routine basis.

F4.3.7.1.5.4 Transmit data for uplink.

A. This requirement shall be verified by test. An SSCC–C&T–TDRSS interface test shall be run between the SSCC, TDRSS, and the C&T. The test will include the SSCC transmitting the composite uplink data stream to the TDRSS to the C&DH system. Reception by the C&DH of uplink commands and voice per SSP 42018 and SSP 50072 is verification of this requirement.

B. This requirement shall be verified by demonstration. The SSCC capability to monitor core command content and to restrict core and payload command sources shall be demonstrated in simulations with the SSTF. The SSCC operator shall monitor the content of core commands, confirming reception of same by the SSTF. The SSCC operator shall demonstrate the ‘restrict core and payload command sources’ by inhibiting those sources, initiating commands from those sources, and confirming that the SSTF did not receive those commands. The verification shall be considered successful when the SSCC operator confirms the proper display of telemetry data from the SSTF.

C. This requirement shall be verified by test. A script of commands shall be uplinked. An SSCC operator shall confirm that the commands were recorded. The verification is complete when the operator confirms the recorded command script contents.

D. This requirement shall be verified by test. An SSCC Data Processing–Space Station ISS C&DH software processing interface test shall be run between the SSCC and the Station Command and Data Handling system. The verification is complete upon confirmation of successful command reception by the C&DH when the command input loading to the SSCC exceeds the uplink rate.

E. This requirement shall be verified by analysis. Lower level test data and design data relative to command processing delays shall be compiled. Verification shall be successful when the delay is shown to be less than 1 second.

F4.3.7.1.6 Support downlinked data.

No verification required.

F4.3.7.1.6.1 Receive downlinked data.

A. This requirement shall be verified by test. An SSCC–C&T–TDRSS interface test shall be run between the SSCC, TDRSS, and the C&T. The test shall include the reception of Station S–band and Ku–band data rates at the SSCC. The test shall be successful when the SSCC can process telemetry, annunciate voice, and display television as received over the S and Ku–band data streams per SSP 42018 and SSP 50072.

B. This requirement shall be verified by test. An SSCC–C&T–TDRSS interface test shall be run between the SSCC, TDRSS, and the C&T. The test shall include the reception of Station S–band and Ku–band data rates at the SSCC. The test shall exercise the SSCC capability to status the quality of the downlink data streams containing the systems and payload safety telemetry data. The verification is complete when the SSCC operator confirms that the quality of the data received is consistent with the predicted data quality.

F4.3.7.1.6.2 Prepare downlinked data for ground use.

A. This requirement shall be verified by test. An SSCC–C&T–TDRSS interface test shall be run between the SSCC, TDRSS, and the C&T. The test shall include the reception of Station S–band and Ku–band data rates at the SSCC. The test shall be successful when the SSCC can process telemetry, annunciate voice, and display television as received over the S and Ku–band data streams.

B. This requirement shall be verified by test. An SSCC Data Processing–Space Station ISS C&DH software processing interface test shall be run between the SSCC and the Station Command and Data Handling system. Core systems and payload safety data shall be processed. The verification is complete when the SSCC operator confirms proper display of telemetry data.

C. This requirement shall be verified by test. An SSCC Data Processing–Space Station ISS C&DH software processing interface test shall be run between the SSCC and the Station Command and Data Handling system. Core systems and payload safety data shall be processed. The verification is complete when the SSCC operator confirms proper display of telemetry data.

D. This requirement shall be verified by test. An SSCC Data Processing–Space Station ISS C&DH software processing interface test shall be run between the SSCC and the Station Command and Data Handling system. Core systems and payload safety data shall be processed. The verification is complete when the SSCC operator confirms proper display of telemetry data in engineering units.

E. This requirement shall be verified by analysis. Lower level test data and design data relative to data processing and display processing shall be compiled. The verification is successful when it can be shown that the delay is less than 5 sec.

F4.3.7.1.6.3 Convert data for external ground interfaces.

This requirement shall be verified by demonstration. Simulations shall be accomplished with the SSTF to demonstrate the conversion of systems telemetry, payload safety data and audio into

forms compatible with the SSCC external interfaces. Simulations shall be accomplished with test generators to demonstrate the conversion of video signals into compatible external interface formats. The verification is complete when it has been shown that the SSCC provides readable data to the external interfaces on a routine basis.

F4.3.7.1.6.4 Record downlinked data.

A. This requirement will be verified by demonstration. The SSCC capability to record and playback S–band and Ku–band systems telemetry, payload safety data, audio and video will be demonstrated by SSCC operators during simulations with the SSTF. Simulated downlink data shall be recorded and then retrieved for playback. The verification is complete when it has been shown that the SSCC operators can retrieve and playback the recorded data.

B. This requirement will be verified by demonstration. When tracking target of opportunities, tracking data shall be recorded and retrieved. The verification is complete when it has been shown that the SSCC operators are able to retrieve the recorded tracking data.

F4.3.7.1.6.5 Archive recorded flight–ground data.

This requirement shall be verified by demonstration. The SSCC operators shall demonstrate the archival and successful retrieval of systems telemetry, payload safety data, audio and video during the conduct of simulations with the SSTF. The verification is complete when it is shown that the SSCC operators can retrieve archived data on a routine basis.

F4.3.7.1.6.6 Playback recorded flight–ground data.

A. This requirement will be verified by demonstration. When tracking target of opportunities, tracking data shall be recorded and retrieved. The SSCC operators shall demonstrate the archival and successful retrieval of systems telemetry, payload safety data, audio and video during the conduct of simulations with the SSTF. The verification is complete when it has been shown that the SSCC operators are able to retrieve the archived data.

B**.** This requirement will be verified by demonstration. The SSCC capability to record and playback S–band and Ku–band systems telemetry, payload safety data, audio and video will be demonstrated by SSCC operators during simulations with the SSTF. The demonstration shall perform simultaneous recording, storage and playback of simulated flight and actual JSC originated video. The verification is complete when it has been shown that the SSCC routinely provides simultaneous recording, storage and playback of the video with no loss of data.

F4.3.7.1.6.7 Distribute data on ground.

A. This requirement shall be verified by demonstration. The SSCC operators shall demonstrate the distribution of systems telemetry, payload safety data, audio, and video to destinations both internal and external to the SSCC during the conduct of simulations with the SSTF. The verification is complete when it has been shown that the SSCC data distribution to the SSTF is verified by SSCC receipt of confirming data from the SSTF.

B. This requirement shall be verified by demonstration. The SSCC operators shall demonstrate the SSCC capability to output real–time processed telemetry to remote users in the conduct of a simulation with the SSTF and a remote user. The verification is complete when receipt of the processed telemetry data distribution is confirmed by the remote user.

C. This requirement shall be verified by demonstration during Shuttle flights. SSCC distribution of video during Shuttle flights is the same as required for ISS. The verification is complete when it is shown that the SSCC provides for video distribution during Shuttle flights

F4.3.7.1.7 Perform task training.

No verification required.

F4.3.7.1.7.1 Perform Space Station task training.

This requirement shall be verified by analysis and demonstration. An analysis shall be performed to identify the console support and calculation tools available to the operator station. A demonstration shall be performed to show that each of the identified tools can be accessed by the console operator from the normal operators position. The demonstration shall also show that a non–operator (observer) can maintain continuous cognizance of the operator (student) actions and system responses. Verification shall be considered successful when it has been shown that the tools identified by the analysis are available to the console operator and that the observer/instructor can stay fully aware of the student actions and the SSCC responses to them.

F4.3.7.1.8 Perform function training.

No verification required.

F4.3.7.1.8.1 Perform Space Station functional training.

A. This requirement is encompassed by the requirements below. Verification of the remainder of paragraph 3.7.1.8.1 constitutes verification of this requirement.

B. This requirement shall be verified by demonstration. A demonstration shall be performed to show that training audio and simulated uplink data can be generated at the SSCC and received at the SSTF. The demonstration shall also show that training audio, video and simulated downlink data can be generated at the SSTF and received at the SSCC. The verification shall be considered successful when it has been shown that training audio and simulated uplink data, when generated in the SSCC, is presented at the SSCC/SSTF training interface and that training audio, video and simulated downlink data, when presented at the SSCC/SSTF interface, is made available to the SSCC operators in a manner that defines them as being training related.

C. This requirement shall be verified by demonstration and analysis. A demonstration shall be performed to show that operator and signal interfaces to or from the SSCC are uniquely identified as pertaining to real–time or training operations and that the displays and stored records also are uniquely identified as real–time or training related. An analysis shall be

performed to show that audio, video and uplink/downlink data uniquely identified as training related, is precluded from being presented to real–time operational interfaces. The verification shall be considered successful when it has been shown that the unique identification of the training and/or real–time displays and records provide unambiguous indication to the operators of the application of the data; and training video, audio and data cannot be transferred across real–time operational interfaces.

D. This requirement shall be verified by demonstration. A demonstration of simultaneous function training and real–time operational simulations shall be performed. The verification shall be considered successful when it has been shown that simultaneous function training and real–time operations can be performed independently and with unambiguous isolation between real–time and training activities.

E. This requirement shall be verified by demonstration. A demonstration shall be performed to show that audio training communications can be generated at the SSCC and received at the SSMTF and WETF/NBL. The demonstration shall also show that audio and video training communications can be generated at the SSMTF and the WETF/NBL and received at the SSCC. The verification shall be considered successful when it has been shown that audio training communications, when generated in the SSCC, is presented to the SSCC/SSMTF and WETF/NBL training output interfaces and that audio and video communications, when presented at the SSCC/SSMTF or WETF/NBL training input interfaces, are made available to the SSCC operators in a manner that identifies them as training related

F4.3.7.1.9 Perform operations training.

No verification required.

F4.3.7.1.9.1 Perform NASA operations training.

A. See 4.3.7.1.8.1.A for verification requirement. Verification of 3.7.1.9.1.A shall be considered successful when 3.7.1.8.1.A is verified.

B. See 4.3.7.1.8.1.B for verification requirement. Verification of 3.7.1.9.1.B shall be considered successful when 3.7.1.8.1.B is verified.

C. See 4.3.7.1.8.1.D for verification requirement. Verification of 3.7.1.9.1.C shall be considered successful when 3.7.1.8.1.D is verified.

D. See 4.3.7.1.8.1.E for verification requirement. Verification of 3.7.1.9.1.D shall be considered successful when 3.7.1.8.1.E is verified.

F4.3.7.1.9.2 Perform International Partner operations training.

A. This requirement shall be verified by examination and analysis. An examination of the SSCC drawings shall be conducted to confirm that the SSCC includes an interface connection for each IP. An analysis shall be performed to confirm that the IP interfaces will support the interface characteristics defined in the IP ICDs identified in 3.7.1.9.2.A. Verification shall be

considered successful when it has been shown that interface circuits are provided for each of the international partners and that the interface circuits are compatible with the interface characteristics defined by the ICDs with each IP.

B. See 4.3.7.1.8.1.B for verification requirement. Verification of 3.7.1.9.2.B shall be considered successful when 3.7.1.8.1.B is verified.

C. See 4.3.7.1.8.1.D for verification requirement. Verification of 3.7.1.9.2.C shall be considered successful when 3.7.1.8.1.D is verified.

F4.3.7.2 Payload Operations Integration Center (POIC).

No verification required.

F4.3.7.2.1 Purpose.

No verification required.

F4.3.7.2.2 Description.

No verification required.

F4.3.7.2.3 Space Station system performance analysis.

No verification required.

F4.3.7.2.3.1 Analyze operations performance.

A. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

B. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.2.3.2 Manage Station Configuration.

This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.2.3.3 Manage Station Resources.

This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.2.4 Support on–orbit operations.

No verification required.

F4.3.7.2.4.1 Monitor and assess payload operations.

A. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

B. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

C. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this

segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

D. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

E. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.2.4.2 Execute payload operations.

A. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

B. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

C. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

D.. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

E. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F. This requirement shall be verified by analysis. An analysis of the POIC end item specification (MSFC–PLAN–904) shall be performed to identify that the end item aggregate equates to this system requirement. Analysis shall include independent hardware/software validation to establish that the hardware/software requirements have been implemented in the command system properly and that there is configuration management of control center configuration items.

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G. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

H. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

I. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

J. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

K. This requirement shall be verified by analysis. A list of all hazardous commands will be prepared by the hardware/software providers/integrators and provided to the payload operations organization. The payload operations organization will ensure that all hazardous commands identified on the list are specified in the database and that personnel not involved in the development of the database will check all commands in the final database against the provided list.

L. This requirement shall be verified by analysis. An analysis of the SSCC end item specification shall be performed to identify the end item requirements which, in the aggregate, equate to this segment requirement. A further analysis of the POIC end item verification report shall be performed to confirm that each of the identified end item requirements have been verified. Verification shall be considered successful when it has been shown that each of the end item requirements derived from this segment requirement have been successfully verified.

M. This requirement shall be verified by analysis. An analysis of the POIC end item specification (MSFC–PLAN–904) shall be performed to identify the end item requirements which, in their aggregate, equate to this segment requirement. A further analysis of the POIC end item verification report shall be performed to confirm that each of the identified end item requirements have been verified. Verification shall be considered successful when it has been shown that each of the end item requirements derived from this segment requirement have been successfully verified.

N. This requirement shall be verified by analysis. An analysis of the POIC end item specification (MSFC–PLAN–904) shall be performed to identify the end item requirements which, in their aggregate, equate to this segment requirement. A further analysis of the POIC end item verification report shall be performed to confirm that each of the identified end item requirements have been verified. Verification shall be considered successful when it has been shown that each of the end item requirements derived from this segment requirement have been successfully verified.

O. This requirement shall be verified by analysis. An analysis of the POIC end item specification (MSFC–PLAN–904) shall be performed to identify the end item requirements which, in their aggregate, equate to this segment requirement. A further analysis of the POIC

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end item verification report shall be performed to confirm that each of the identified end item requirements have been verified. Verification shall be considered successful when it has been shown that each of the end item requirements derived from this segment requirement have been successfully verified.

P. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that each of the end item requirements that equate to this segment requirement have been successfully verified.

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F4.3.7.2.4.3 Execute ground operations.

A. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

B. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

C This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

D. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.2.5 Provide data for uplink.

No verification required.

F4.3.7.2.5.1 Acquire data for uplink.

This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.2.5.2 Transfer data intended for on–orbit Space Station.

A. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

B. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

C. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

D. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

E. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.2.6 Support downlink data.

No verification required.

F4.3.7.2.6.1 Receive downlinked data.

A. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

B. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

C. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

D. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

E. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.2.6.2 Prepare downlinked data for ground use.

A. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

B. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

C. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

D. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–STD–1274, Vol. 2) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful

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when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

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F4.3.7.2.6.3 Convert data for external ground interfaces.

This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.2.6.4 Distribute data on ground.

A. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

B. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.2.6.5 Record downlinked data.

A. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

B. This requirement shall be verified by analysis. An analysis shall be performed of the POIC end item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has

been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.2.6.6 Playback recorded flight–ground data

This requirement shall be verified by analysis. An analysis shall be performed of the POIC and item specification (MSFC–PLAN–904) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

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provide the acquisition information for ground tracking sites, for the TDRS, for specified satellite targets, and for ground targets.

E. The capability to provide data driven graphical displays and replanning support for SSRMS robotics on–orbit operations shall be verified by analysis. An analysis shall be conducted of the Institutional Robotics Applications (IRA) (JSC 35500) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to provide data driven graphical displays and replanning support for SSRMS robotics on–orbit operations.

F. The capability to compute the ISS mass properties and to transfer updates to the ISS, via the SSCC, to update the on–board mass properties data shall be verified by analysis. An analysis shall be conducted of the FDPA (JSC 13419), RUPSM (JSC 13522), CMILP (JSC 13347) and PIM (JSC 13196) subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to compute the ISS mass properties and to transfer updates to the ISS, via the SSCC, to update the on–board mass properties data.

G. The capability to perform orbit lifetime analyses and ISS orbit altitude management strategy shall be verified by analysis. An analysis shall be conducted of the FDPA subsystem (JSC 13419) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to perform orbit lifetime analyses and ISS orbit altitude management strategy.

H. The capability to compile and control the configuration of the Systems Operations Data File (SODF) procedures required to support on–board activities shall be verified by analysis. An analysis shall be conducted of the PDAC subsystem (JSC 13325) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to compile and control the configuration of the SODF procedures required to support onboard activities.

F4.3.7.5.4.2 Planning Systems Backup Support

A. The IPS capability to support backup planning for USOS core systems from IPS equipment located in the MCC–M shall be verified by analysis. An analysis shall be conducted of the IPS subsystem end item qualification reports as well as the installation and testing reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the capability to support backup planning for USOS core systems from IPS equipment located in the MCC–M is operational. This shall include timeline generation, flight dynamics and systems analyses, inventory tracking, and procedure generation/management.

B. The IPS capability to support a minimum of one week of planning support for USOS core system operations from the backup planning capability in the MCC–M shall be verified by analysis. An analysis shall be conducted of the IPS subsystem end item qualification reports as well as the installation and testing reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the capability to support a minimum of one week of planning support for USOS core system operations from the backup planning capability in the MCC–M is operational. (Note that an RMA analysis of the backup planning capability will not be required to successfully conclude this verification.)

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C. The RGS provision of facility and interface accommodations for SSCC backup planning equipment that will be located in the MCC–M shall be verified by analysis. An analysis shall be conducted of the backup facility installation and testing end item qualification reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the RGS is able to provide facility and interface accommodations for SSCC backup planning equipment that will be located in the MCC–M.

F4.3.7.5.4.3 Support Group Planning

A. The IPS capability to support USOS planning from IPS equipment located in the MCC–M for use by HSG shall be verified by analysis. An analysis shall be conducted of the IPS subsystem end item qualification reports as well as the installation and testing reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the capability to support USOS planning from IPS equipment located in the MCC–M for use by the HSG is operational. This shall include timeline generation, flight dynamics and systems analyses, inventory tracking, and procedure generation/management.

B. The RGS provision of facility and interface accommodations for IPS planning equipment located in the MCC–M for use by HSG shall be verified by analysis. An analysis shall be conducted of the IPS planning equipment installation and testing end item qualification reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the RGS is able to provide facility and interface accommodations for IPS planning equipment located in the MCC–M for use by HSG.

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F4.3.7.5.5 Perform resupply/return planning.

No verification required.

F4.3.7.5.5.1 Define resupply/return constraints.

NA

F4.3.7.5.5.2 Define cargo item resupply/return requirements.

The capability to define and update the increment resupply/return cargo item requirements including physical data, Payload priority and unique transportation requirements shall be verified by analysis. An analysis shall be conducted of the CMILP subsystem (JSC 13347) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to define and update increment resupply/return cargo item requirements.

F4.3.7.5.5.3 Develop detailed resupply/return manifests.

The capability to support development and update of detailed resupply/return manifests for on–board crew, core systems, and payload cargo items shall be verified by analysis. An analysis shall be conducted of the CMILP subsystem (JSC 13347) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data

shows that the IPS is able to support development and update of detailed resupply/return manifests for on–board crew, core systems and payload cargo items..

F4.3.7.5.5.4 Develop logistics carrier plans.

The capability to provide the resupply/return load manifest requirements for on–board crew, core systems and payloads to support development and update of load plans for integrating cargo items into logistics carrier accommodations shall be verified by analysis. An analysis shall be conducted of the CMILP subsystem (JSC 13347) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to provide the resupply/return load manifest requirements for on–board crew, core systems and payloads to support development and update of load plans for integrating cargo items into logistics carrier accommodations.

F4.3.7.5.5.5 Develop orbiter middeck loading plans.

The capability to provide the resupply/return load manifest requirements for on–board crew, core systems and payloads to support development and update of load plans for integrating cargo items into the orbiter middeck shall be verified by analysis. An analysis shall be conducted of the CMILP subsystem (JSC 13347) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to provide the resupply/return load manifest requirements for on–board crew, core systems and payloads to support development and update of load plans for integrating cargo items into the orbiter middeck.

F4.3.7.5.6 Develop increment operations plan.

No verification required.

F4.3.7.5.6.1 Develop station increment operations planning products.

A. The capability to develop ISS on–orbit and ground increment operations planning products shall be verified by analysis. An analysis shall be conducted of the CPS subsystem (JSC 13350) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support development of ISS on–orbit and ground increment operations planning products.

B. The capability to simultaneously support planning for up to ten increments within the flow of the pre–increment production process shall be verified by analysis. An analysis shall be conducted of the IPS (JSC 13196) platform and subsystem design review material and the end item qualification reports for each of the IPS subsystems. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to simultaneously support planning for up to ten increments within the flow of the pre–increment production process.

C. The capability to support analyses of proposed plans and trade studies shall be verified by analysis. An analysis shall be conducted of the CPS (JSC 13350), FDPA (JSC 13419) and RUPSM (JSC 13522) subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support analyses of proposed plans and trade studies.

D. The capability to detect activity timeline or resource conflicts and support generation of conflict free activity timelines consistent with operational constraints shall be verified by analysis. An analysis shall be conducted of the CPS (JSC 13350), FDPA (JSC 13419) and RUPSM (JSC 13522) subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to detect activity timeline or resource conflicts and support generation of conflict free activity timelines consistent with operational constraints.

E. The capability to develop and create the increment operations plan (IOP), the short term (weekly) plan (STP), the on–board STP (OSTP), and the STP/OSTP replan shall be verified by analysis. An analysis shall be conducted of the CPS (JSC 13350) and Planning Information Management (PIM) subsystem (JSC 13196) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to develop and create the IOP, the STP, the OSTP and the STP/OSTP replan.

F. The capability to automatically and interactively generate partial or complete activity timelines for ISS operations shall be verified by analysis. An analysis shall be conducted of the CPS subsystem (JSC 13350) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to automatically and interactively generate partial or complete activity timelines for ISS operations.

G. The capability to model operational constraints such as resources, temporal relationships, environmental conditions, rights, privileges, safety and hazard constraints in the IPS planning resources shall be verified by analysis. An analysis shall be conducted of the CPS (JSC 13350), FDPA (JSC 13419) and RUPSM (JSC 13522) subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to model operational constraints such as resources, temporal relationships, environmental conditions, rights, privileges, safety and hazard constraints.

H. The capability to provide attitude timelines shall be verified by analysis. An analysis shall be conducted of the CPS (JSC 13350) and FDPA (JSC 13419) subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to provide attitude timelines.

I. The capability to create operations plans that may contain multiple levels of abstraction, details, or constraints shall be verified by analysis. An analysis shall be conducted of the CPS subsystem (JSC 13350) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support creation of operations plans with multiple levels of abstraction, details, or constraints.

J. The capability to provide for manipulator systems operations planning and analysis shall be verified by analysis. An analysis shall be conducted of the IRA subsystem (JSC 35500) end

item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support manipulator systems operations planning and analysis.

K. The capability to support generation of robotics timelines shall be verified by analysis. An analysis shall be conducted of the IRA (JSC 35500) and CPS (JSC 13350) subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support generation of robotics timelines.

L. The capability to provide for electronic display and user review of operations plans during on–orbit operations shall be verified by analysis. An analysis shall be conducted of the CPS (JSC 13350) subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to provide electronic display and support user review of operations plans during on–orbit operations.

M. The capability to provide configuration management of operations plans shall be verified by analysis. An analysis shall be conducted of the CPS (JSC 13350) and PIM subsystem (JSC 13196) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to provide for configuration management of operations plans.

N. The capability to store operations plans and supporting data in a manner that facilitates retrieval for revision, production of physical products or transmission to users via electronic interfaces shall be verified by analysis. An analysis shall be conducted of the PIM subsystem (JSC 13196) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to store operations plans and supporting data in a manner that facilitates retrieval, production, or transmission to users.

O. The capability to support production of physical operations planning products shall be verified by analysis. An analysis shall be conducted of the CPS (JSC 13350) subsystem and the PIM subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support production of physical operations planning products.

P. The capability to support distribution of physical operations plan products to ground controllers and flight crews shall, be verified by analysis. An analysis shall be conducted of the PIM subsystem (JSC 13196) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support distribution of physical operations plan products.

Q. The capability to retrieve electronic operations planning files from storage for electronic delivery to ground segment users, flight controllers, and the on–orbit crew shall be verified by analysis. An analysis shall be conducted of the PIM subsystem (JSC 13196) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to retrieve electronic operations planning

files from storage and deliver them electronically to ground segment users, flight controllers, and the on–orbit crew.

F4.3.7.5.6.2 Develop integrated increment operations planning products.

A. The capability to provide for integration of inputs to the consolidated ISS operations plans and ground operations plans affecting on–orbit station operations shall be verified by analysis. An analysis shall be conducted of the CPS (JSC 13350) and PIM (JSC 13196) subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to integrate inputs to the consolidated ISS operations plans and ground operations plans affecting on–orbit station operations.

B. The capability to provide the POIC with a distribution of agreed upon ISS resources and time frames within which payload operations may be performed for integrated operations plans shall be verified by analysis. An analysis shall be conducted of the CPS (JSC 13350) subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to provide the POIC with a distribution of agreed upon ISS resources and time frames within which payload operations may be performed.

F4.3.7.5.6.3 Develop user payload increment operations planning products.

The capability to support the POIC in development of user payload increment operations plans for up to ten simultaneous increments within the flow of the pre–increment production process shall be verified by analysis. An analysis shall be conducted of the CPS (JSC 13350) subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support the POIC in development of user payload increment operations plans for up to ten simultaneous increments within the flow of the pre–increment production process.

F4.3.7.5.7 Develop weekly planning products.

No verification required.

F4.3.7.5.7.1 Develop station weekly operations planning products.

The capability to develop station on–orbit and ground weekly planning products shall be verified by analysis. An analysis shall be conducted of the CPS subsystem (JSC 13350) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to develop station on–orbit and ground weekly planning products.

F4.3.7.5.7.2 Develop integrated weekly operations planning products.

The capability to integrate station and payload on–orbit/ground operations plans affecting on–orbit operations shall be verified by analysis. An analysis shall be conducted of the CPS

subsystem (JSC 13350) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to integrate station and payload on–orbit/ground operations plans affecting on–orbit operations.

F4.3.7.5.7.3 Develop user payload weekly operations planning products.

The capability to support development of user payload on–orbit weekly operations planning products and ground operations plans affecting on–orbit operations shall be verified by analysis. An analysis shall be conducted of the CPS subsystem (JSC 13350) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support development of user payload on–orbit weekly planning products and ground operations plans affecting on–orbit operations.

F4.3.7.5.8 Perform real–time planning support.

No verification required.

F4.3.7.5.8.1 Perform station operations real–time planning support.

The capability to support real time planning of station on–orbit/ground operations in response to user, crew, and ground controller requirements shall be verified by analysis. An analysis shall be conducted of the CPS subsystem (JSC 13350) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support real time planning of station on–orbit and ground operations.

F4.3.7.5.8.2 Perform integrated real–time planning support.

The capability to provide for integrated real–time planning of payload operations affecting on–orbit station operations and on–orbit station operations affecting payload operations shall be verified by analysis. An analysis shall be conducted of the CPS subsystem (JSC 13350) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to provide for integrated real–time planning of payload operations affecting on–orbit station operations and on–orbit station operations affecting payload operations.

F4.3.7.5.9 Develop preliminary procedures.

No verification required.

F4.3.7.5.9.1 Draft preliminary procedures.

A. The capability for IPS users to draft on–orbit automated procedures, on–orbit manual operations procedures and supporting data shall be verified by analysis. An analysis shall be conducted of the PDAC subsystem (JSC 13325) end item qualification reports. The verification

shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support users in drafting procedures and supporting data.

B. The capability to support generation of robotics operations procedures and supporting data shall be verified by analysis. An analysis shall be conducted of the IRA and the PDAC subsystem (JSC 13325) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support generation of robotics operations procedures and supporting data.

F4.3.7.5.9.2 Validate preliminary procedures.

The capability to validate procedures shall be verified by analysis. An analysis shall be conducted of the PDAC subsystem (JSC 13325) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support validation of the procedures developed to perform flight controller operations.

F4.3.7.5.9.3 Revise preliminary procedures.

The capability to update and revise preliminary procedures including on–orbit automated procedures, on–orbit manual procedures, and supporting data shall be verified by analysis. An analysis shall be conducted of the PDAC subsystem (JSC 13325) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to update and revise preliminary procedures and supporting data.

F4.3.7.5.9.4 Control preliminary procedure configuration.

The capability to control the configuration of on–orbit automated procedures, on–orbit manual procedures and supporting data shall be verified by analysis. An analysis shall be conducted of the PDAC subsystem (JSC 13325) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to control the configuration of procedures, and supporting data.

F4.3.7.5.9.5 Transfer preliminary procedures.

The capability to transfer procedures shall be verified by analysis. An analysis shall be conducted of the PDAC subsystem (JSC 13325) and the PIM subsystem (JSC 13196) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to transfer preliminary procedures to the final procedure storage location.

F4.3.7.5.10 Maintain final procedures.

No verification required.

F4.3.7.5.10.1 Store final procedures.

The capability to store validated final procedures and supporting data in a manner that facilitates retrieval for revision, production of physical products (manuals, cue cards, etc.) or transmission to users via electronic interfaces shall be verified by analysis. An analysis shall be conducted of the PDAC subsystem (JSC 13325) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to store validated final procedures and supporting data in a manner that facilitates retrieval for revision, production of physical products or transmission to users via electronic interfaces.

F4.3.7.5.10.2 Control final procedure configuration.

The capability to control the configuration of final on–orbit automated procedures, on–orbit manual procedures, and supporting data shall be verified by analysis. An analysis shall be conducted of the PDAC subsystem (JSC 13325) and the PIM subsystem (JSC 13196) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to control the configuration of final procedures and supporting data.

F4.3.7.5.11 Deliver final procedures.

No verification required.

F4.3.7.5.11.1 Produce physical final procedure products.

The capability to support production of physical procedure products such as checklists for on–orbit automated procedures, and on–orbit manual procedures shall be verified by analysis. An analysis shall be conducted of the PDAC subsystem (JSC 13325) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support production of physical procedure products.

F4.3.7.5.11.2 Deliver physical final procedure products.

The capability to support delivery of physical procedure products to ground controllers and flight crews shall be verified by analysis. An analysis shall be conducted of the PDAC subsystem (JSC 13325) end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to support delivery of physical procedure products to ground controllers and flight crews.

F4.3.7.5.11.3 Retrieve and deliver electronic final procedure products.

The capability to retrieve electronic procedure files from storage for delivery to ground segment users, flight controllers, and on–orbit crew shall be verified by analysis. An analysis shall be

conducted of the PDAC subsystem (JSC 13325) and the PIM subsystem (JSC 13196) and the subsystem end item qualification reports. The verification shall be considered successful when the analysis of the lower level qualification data shows that the IPS is able to retrieve electronic procedure files from storage and deliver them to requested location or user.

F4.3.7.6 Payload planning System (PPS).

No verification required.

F4.3.7.6.1 Purpose.

No verification required.

F4.3.7.6.2 Description.

No verification required.

F4.3.7.6.3 Develop increment operations planning products.

No verification required.

F4.3.7.6.3.1 Develop integrated increment operations planning products.

The integrated increment operations planning products generation capability shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

F4.3.7.6.3.2 Develop user payload increment operations planning products.

A. The modeling capability shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

B. The scheduling capability shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level.

Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

C. The product generation capability shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

D. The execution details generation and correlation capability shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

E. The importing and exporting capability shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

F. The payload data configuration management capability shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

G. The distributed planning capability shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

F4.3.7.6.4 Develop weekly planning products.

No verification required.

F4.3.7.6.4.1 Develop integrated weekly operations planning products.

The capability to provide the payload part of the Space Station on–orbit/ground operations weekly plans shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

F4.3.7.6.4.2 Develop user payload weekly operations planning products.

The capability to provide user payload on–orbit weekly planning products and ground operations plans shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

F4.3.7.6.5 Perform real time planning support.

No verification required.

F4.3.7.6.5.1 Perform integrated real–time planning support.

The capability to provide reports for conduct of integrated real–time planning and execution activities shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

F4.3.7.6.5.2 Perform user payload operations real–time planning support.

The capability to provide reports for conduct of user payload operations planning and execution shall be verified by analysis of the PPS end item specification (SW683–70256–1) and the end item validation test report. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

F4.3.7.7 Mission Build facility (MBF).

No verification required.

F4.3.7.7.1 Purpose.

No verification required.

F4.3.7.7.2 Description.

No verification required.

F4.3.7.7.3 Provide reconfiguration products and data files.

No verification required.

F4.3.7.7.3.1 Support acceptance and audit of flight software inputs.

This requirement shall be verified by performing an analysis of the prime item development specification (PIDS) for the Mission Build Facility (S684–10141) and its verification activities. The analysis shall identify those PIDS requirements which, in their aggregate equate to this segment requirement. The PIDS qualification report shall be analyzed to confirm that all identified PIDS requirements have been verified. Verification shall be considered successful when it has been shown that all PIDS requirements derived from this requirement have been verified.

F4.3.7.7.3.2 Support acceptance and audit of data inputs.

This requirement shall be verified by performing an analysis of the prime item development specification (PIDS) for the Mission Build Facility (S684–10141) and its verification activities. The analysis shall identify those PIDS requirements which, in their aggregate equate to this segment requirement. The PIDS qualification report shall be analyzed to confirm that all identified PIDS requirements have been verified. Verification shall be considered successful when it has been shown that all PIDS requirements derived from this requirement have been verified.

F4.3.7.7.3.3 Support flight load builds and data file generation.

A. This requirement shall be verified by performing an analysis of the prime item development specification (PIDS) for the Mission Build Facility (S684–10141) and its verification activities. The analysis shall identify those PIDS requirements which, in their aggregate equate to this segment requirement. The PIDS qualification report shall be analyzed to confirm that all identified PIDS requirements have been verified. Verification shall be considered successful when it has been shown that all PIDS requirements derived from this requirement have been verified.

B. This requirement shall be verified by performing an analysis of the prime item development specification (PIDS) for the Mission Build Facility (S684–10141) and its verification activities. The analysis shall identify those PIDS requirements which, in their aggregate equate to this segment requirement. The PIDS qualification report shall be analyzed to confirm that all identified PIDS requirements have been verified. Verification shall be considered successful when it has been shown that all PIDS requirements derived from this requirement have been verified.

F4.3.7.7.3.4 Support configuration control of MBF input products and output products.

The capability to create certified copies of verified reconfiguration products images and data files/reports for external users shall be verified by analysis. An analysis of the MBF Prime Item Development Specification (PIDS) shall be performed to identify those requirements that in their aggregate comprise this segment requirement. A further analysis shall be performed to verify that all of the derived requirements in the PIDS have been verified. Verification shall be considered successful when it has been confirmed that all PIDS requirements that represent this segment requirement have been successfully verified.

F4.3.7.7.3.5 Support distribution of reconfiguration product loads and data files.

This requirement shall be verified by performing an analysis of the prime item development specification (PIDS) for the Mission Build Facility (S684–10141) and its verification activities. The analysis shall identify those PIDS requirements which, in their aggregate equate to this segment requirement. The PIDS qualification report shall be analyzed to confirm that all identified PIDS requirements have been verified. Verification shall be considered successful when it has been shown that all PIDS requirements derived from this requirement have been verified.

F4.3.7.8 Payload Software Integration and Verification (PSIV).

No verification required.

F4.3.7.8.1 Purpose.

No verification required.

F4.3.7.8.2 Description.

No verification required.

F4.3.7.8.3 Provide reconfiguration products and data files.

No verification required.

F4.3.7.8.3.1 Support flight load builds and data file generation.

A. The capability to develop a payload software integration and verification environment and a portable test environment for payloads to support payload software development and integration with the station command and data handling system shall be verified by analysis of the qualification reports from the PSIV prime item development specification (S683–35451). Analysis shall identify the requirements in the PIDS that are derived from this USGS requirement and verify that those requirements have been successfully qualified at the PIDS end item level. Verification shall be considered successful when it has been shown that all requirements of the PIDS that are extracted or derived from the subject USGS paragraph are successfully verified.

B. The capability to develop, integrate and verify software, displays, and data resident in station provided processors required to support payload execution shall be verified by an analysis of the qualification reports from the PSIV prime item development specification (S683–35451). Analysis shall identify the requirements in the PIDS that are derived from this USGS requirement and verify that those requirements have been successfully qualified at the PIDS end item level. Verification shall be considered successful when it has been shown that all requirements of the PIDS that are extracted or derived from the subject USGS paragraph are successfully verified.

C. The capability to deliver verified and certified payload software to the MBF to support mission builds shall be verified by an analysis of the qualification reports from the PSIV prime item development specification (S683–35451). Analysis shall identify the requirements in the PIDS that are derived from this USGS requirement and verify that those requirements have been successfully qualified at the PIDS end item level. Verification shall be considered successful when it has been shown that all requirements of the PIDS that are extracted or derived from the subject USGS paragraph are successfully verified.

D. The capability to deliver verified and certified payload software to the SVF to support horizontal validation and verification of flight software for ongoing increment operations shall be verified by an analysis of the qualification reports from the PSIV prime item development specification (S683–35451). Analysis shall identify the requirements in the PIDS that are derived from this USGS requirement and verify that those requirements have been successfully qualified at the PIDS end item level. Verification shall be considered successful when it has been shown that all requirements of the PIDS that are extracted or derived from the subject USGS paragraph are successfully verified.

E. The capability to deliver verified and certified payload software to the SSTF to support flight crew training for ongoing increment operations shall be verified by an analysis of the qualification reports from the PSIV prime item development specification (S683–35451). Analysis shall identify the requirements in the PIDS that are derived from this USGS requirement and verify that those requirements have been successfully qualified at the PIDS end item level. Verification shall be considered successful when it has been shown that all requirements of the PIDS that are extracted or derived from the subject USGS paragraph are successfully verified.

F4.3.7.8.3.2 Support configuration control of reconfiguration products and data.

A. The capability to maintain configuration control of the payload avionics reconfiguration products and data shall be verified by analysis of the qualification reports from the PSIV prime item development specification (S683–35451). Analysis shall identify the requirements in the PIDS that are derived from this USGS requirement and verify that those requirements have been successfully qualified at the PIDS end item level. Verification shall be considered successful when it has been shown that all requirements of the PIDS that are extracted or derived from the subject USGS paragraph are successfully verified.

B. The requirement to support the development of real time changes to payload flight software shall be verified by analysis of the qualification reports from the PSIV prime item development specification (S683–35451). Analysis shall identify the requirements in the PIDS that are derived from this USGS requirement and verify that those requirements have been successfully qualified at the PIDS end item level. Verification shall be considered successful when it has been shown that all requirements of the PIDS that are extracted or derived from the subject USGS paragraph are successfully verified.

C. The requirement to verify real–time changes to payload flight software shall be verified by analysis of the qualification reports from the PSIV prime item development specification (S683–35451). Analysis shall identify the requirements in the PIDS that are derived from this USGS requirement and verify that those requirements have been successfully qualified at the PIDS end item level. Verification shall be considered successful when it has been shown that all requirements of the PIDS that are extracted or derived from the subject USGS paragraph are successfully verified.

F4.3.7.8.4 Verify reconfiguration products.

No verification required.

F4.3.7.8.4.1 Perform increment reconfiguration product and data verification.

A. The capability to verify increment configurations of payload complement software and data shall be verified by analysis of the qualification reports from the PSIV prime item development specification (S683–35451). Analysis shall identify the requirements in the PIDS that are derived from this USGS requirement and verify that those requirements have been successfully qualified at the PIDS end item level. Verification shall be considered successful when it has been shown that all requirements of the PIDS that are extracted or derived from the subject USGS paragraph are successfully verified

B. The requirement to confirm the operational readiness of payload software and reconfiguration data shall be verified by analysis of the qualification reports from the PSIV prime item development specification (S683–35451). Analysis shall identify the requirements in the PIDS that are derived from this USGS requirement and verify that those requirements have been successfully qualified at the PIDS end item level. Verification shall be considered successful when it has been shown that all requirements of the PIDS that are extracted or derived from the subject USGS paragraph are successfully verified.

F4.3.7.9 Space Station Training Facility (SSTF).

No verification required.

F4.3.7.9.1 Purpose.

No verification required.

F4.3.7.9.2 Description.

No verification required.

F4.3.7.9.3 Perform task training.

No verification required.

F4.3.7.9.3.1 Perform Space Station task training.

A. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements

have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

B. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

F4.3.7.9.4 Perform function training.

No verification required.

F4.3.7.9.4.1 Perform Space Station functional training.

A. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

B. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified

C. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified

D. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

E. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

F. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

G. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

H. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

I. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their

sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

F4.3.7.9.4.2 Perform international partner function training.

A. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

B. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

C. This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

F4.3.7.9.5 Perform operations training.

No verification required.

F4.3.7.9.6 Develop preliminary procedures.

No verification required.

F4.3.7.9.6.1 Validate preliminary procedures.

This requirement shall be verified by analysis. An analysis of the SSTF User Detailed Functional Requirements document JSC 24454 (UDFR) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the UDFR qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the UDFR requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

F4.3.7.10 Multi–use Remote Manipulator Development Facility (MRMDF).

No verification required.

F4.3.7.10.1 Purpose.

No verification required.

F4.3.7.10.2 Description.

No verification required.

F4.3.7.10.3 Perform task training.

No verification required.

F4.3.7.10.3.1 Perform Space Station task training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the MRMDF design to provide the required training capabilities.

F4.3.7.10.3.2 Perform payload task training.

A. This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the MRFDF design to provide the required training capabilities.

B. This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the MRMDF design to provide the required training capabilities.

F4.3.7.10.4 Perform function training.

No verification required.

F4.3.7.10.4.1 Perform Space Station functional training.

A. This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the MRMDF design to provide the required training capabilities.

B. This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the MRMDF design to provide the required training capabilities.

F4.3.7.10.4.2 Perform payload functional training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the MRMDF design to provide the required training capabilities.

F4.3.7.11 Space Station Mock–up and Trainer Facility (SSMTF).

No verification required.

F4.3.7.11.1 Purpose.

No verification required.

F4.3.7.11.2 Description.

No verification required.

F4.3.7.11.3 Perform task training.

No verification required.

F4.3.7.11.3.1 Perform Space Station task training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SSMTF design to provide the required training capabilities.

F4.3.7.11.3.2 Perform payload task training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SSMTF design to provide the required training capabilities.

F4.3.7.11.4 Perform function training.

No verification required.

F4.3.7.11.4.1 Perform Space Station functional training.

A. This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SSMTF design to provide the required training capabilities.

B**.** This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SSMTF design to provide the required training capabilities.

C. This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SSMTF design to provide the required training capabilities.

D. This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SSMTF design to provide the required training capabilities.

E. This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SSMTF design to provide the required training capabilities.

F. This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SSMTF design to provide the required training capabilities.

F4.3.7.11.4.2 Perform payload function training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SSMTF design to provide the required training capabilities.

F4.3.7.12 System Engineering Simulator (SES).

No verification required.

F4.3.7.12.1 Purpose.

No verification required.

F4.3.7.12.2 Description.

No verification required.

F4.3.7.12.3 Perform task training.

No verification required.

F4.3.7.12.3.1 Perform Space Station task training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SES design to provide the required training capabilities.

F4.3.7.12.3.2 Perform payload task training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SES design to provide the required training capabilities.

F4.3.7.12.4 Perform function training.

No verification required.

F4.3.7.12.4.1 Perform Space Station functional training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SES design to provide the required training capabilities.

F4.3.7.12.4.2 Perform payload functional training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SES design to provide the required training capabilities.

F4.3.7.13 NBL.

No verification required.

F4.3.7.13.1 Purpose.

No verification required.

F4.3.7.13.2 Description.

No verification required.

F4.3.7.13.3 Perform task training.

No verification required.

F4.3.7.13.3.1 Perform Space Station task training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the NBL design to provide the required training capabilities.

F4.3.7.13.3.2 Perform payload task training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the NBL design to provide the required training capabilities.

F4.3.7.13.4 Perform function training.

No verification required.

F4.3.7.13.4.1 Perform Space Station functional training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the NBL design to provide the required training capabilities.

F4.3.7.13.4.2 Perform payload functional training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the NBL design to provide the required training capabilities.

F4.3.7.13.5 Perform operations training.

No verification required.

F4.3.7.13.5.1 Perform NASA operations training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the NBL design to provide the required training capabilities.

F4.3.7.14 Shuttle Mission Training Facility Space Station Integration.

No verification required.

F4.3.7.14.1 Purpose.

No verification required.

F4.3.7.14.2 Description.

No verification required.

F4.3.7.14.3 Perform task training.

No verification required.

F4.3.7.14.3.1 Perform Space Station task training.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SMTF SSI design to provide the required training capabilities.

F4.3.7.14.4 Perform function training.

No verification required

F4.3.7.14.4.1 Perform Space Station function training.

A. This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SMTF SSI design to provide the required training capabilities.

B. This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the SMTF SSI design to provide the required training capabilities.

F4.3.7.15 Part Task Trainer (PTT).

No verification required.

F4.3.7.15.1 Purpose.

No verification required.

F4.3.7.15.2 Description.

No verification required.

F4.3.7.15.3 Perform task training.

No verification required.

F4.3.7.15.3.1 Perform Space Station system task raining.

This requirement shall be verified by demonstration. Training simulations and corresponding scenarios shall be developed that demonstrate the design capability to execute each of the required training capabilities. The scenarios shall then be executed to provide the required demonstrations. The verification shall be considered successful when the executed scenarios demonstrate the capability of the PTT design to provide the required training capabilities.

F4.3.7.16 Payload Training Complex (PTC).

No verification required.

F4.3.7.16.1 Purpose.

No verification required.

F4.3.7.16.2 Description.

No verification required.

F4.3.7.16.3 Perform task training.

No verification required.

F4.3.7.16.3.1 Perform payload task training.

This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

F4.3.7.16.4 Perform function training.

No verification required.

F4.3.7.16.4.1 Perform payload function training.

A. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

B. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to

confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

C. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

D. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

E. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

F. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

G. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

H. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to

confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

I. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

J. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

K. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

L. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

M. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

N. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to

confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

O. This requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

F4.3.7.16.5 Perform operations training.

No verification required.

F4.3.7.16.5.1 Perform NASA operations training.

The capability to provide the types of operations training identified by this requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

F4.3.7.16.5.2 Perform International Partner operations training.

The capability to provide the international partner operations training identified by this requirement shall be verified by analysis. An analysis of the PTC Requirements document (OD13) shall be performed to identify the detailed requirements therein that are derived from this segment requirement and that in their sum constitute the total intent of the segment requirement. A further analysis of the PTC qualification report shall be conducted to confirm that each of the defined derived requirements have been verified. The verification shall be considered successful when it has been shown that all of the OD13 requirements that are, in their aggregate, equivalent to the segment requirement, have been successfully verified.

F4.3.7.17 Payload integration and checkout facility.

No verification required.

F4.3.7.17.1 Purpose.

No verification required.

F4.3.7.17.2 Description.

No verification required.

F4.3.7.17.3 Provide ground–based physical integration for payloads.

The PICF ground–based physical integration capability for payloads shall be verified by analysis of the end item specifications and the end item activation and validation tests. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

F4.3.7.17.4 Provide ground–based interface checkout for payloads.

A. The PICF ground–based interface for payloads shall be verified by analysis of the end item specifications and the end item activation and validation tests. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

B. The PICF ground–based interface for payloads shall be verified by analysis of the end item specifications and the end item activation and validation tests. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

C. The PICF ground–based interface for payloads shall be verified by analysis of the end item specifications and the end item activation and validation tests. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

D. The PICF ground–based interface for payloads shall be verified by analysis of the end item specifications and the end item activation and validation tests. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item

level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

E. The PICF ground–based interface for payloads shall be verified by analysis of the end item specifications and the end item activation and validation tests. The analysis shall identify those end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further confirm that the identified requirements have been verified at the end item level. Verification shall be considered successful when it has been shown that all end item requirements derived from this segment requirement have been successfully verified.

F4.3.7.18 Telescience Support Centers.

No verification required.

F4.3.7.18.1 Purpose.

No verification required.

F4.3.7.18.2 Description.

No verification required.

F4.3.7.18.3 Support on–orbit payload operations.

No verification required.

F4.3.7.18.3.1 Monitor and assess payload operations.

This requirement shall be verified by analysis. An analysis shall be performed of the TSC end item specification (TBD) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.18.3.2 Execute payload operations.

This requirement shall be verified by analysis. An analysis shall be performed of the TSC end item specification (TBD) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

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F4.3.7.18.3.3 Execute ground operations.

This requirement shall be verified by analysis. An analysis shall be performed of the TSC end item specification (TBD) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.18.4 Support data.

No verification required.

F4.3.7.18.4.1 Receive data.

This requirement shall be verified by analysis. An analysis shall be performed of the TSC end item specification (TBD) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.18.4.2 Prepare data for ground use.

This requirement shall be verified by analysis. An analysis shall be performed of the TSC end item specification (TBD) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.18.4.3 Distribute data on ground.

This requirement shall be verified by analysis. An analysis shall be performed of the TSC end item specification (TBD) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.18.4.4 Store data on ground.

This requirement shall be verified by analysis. An analysis shall be performed of the TSC end item specification (TBD) and the end item verification report to identify all of the end item

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requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.18.5 Perform operations training.

This requirement shall be verified by analysis. An analysis shall be performed of the TSC end item specification (TBD) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.18.6 Perform Training and Certification.

This requirement shall be verified by analysis. An analysis shall be performed of the TSC end item specification (TBD) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.18.7 Access to mission support services.

This requirement shall be verified by analysis. An analysis shall be performed of the TSC end item specification (TBD) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

F4.3.7.18.8 Security.

This requirement shall be verified by analysis. An analysis shall be performed of the TSC end item specification (TBD) and the end item verification report to identify all of the end item requirements which, in their aggregate, comprise this segment requirement. The analysis shall further verify that each of the end item requirements derived from this segment requirement have been verified. Verification shall be considered successful when it has been shown that all of the end item requirements that equate to this segment requirement have been successfully verified.

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F4.3.7.19 ISS MOD Avionics Reconfiguration Subsystem (IMARS).

F4.3.7.19.1 Purpose.

No verification is required.

F4.3.7.19.2 Description

No verification is required.

F4.3.7.19.3 Provide Reconfiguration Products and Data Files.

F4.3.7.19.3.1 Support ISS Avionics Reconfiguration

A. The IMARS capability to support user review and enhancement of MBF–provided telemetry and command reconfiguration data files needed to support onboard and ground operational requirements shall be verified by analysis. An analysis shall be conducted of the IMARS subsystem (JSC 37544, Integrated Planning System (IPS) International Space Station (ISS) Mission Operations Directorate (MOD) Avionics Reconfiguration Subsystem (IMARS) Functional Requirements) end item qualification reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the IMARS is able to support user review and enhancement of MBF–provided telemetry and command reconfiguration data files needed to support onboard and ground operational requirements.

B. The IMARS capability to return the utilization file products to the MBF in support of the Instrumentation Program and Command List process for use in creation of standard output products shall be verified by analysis. An analysis shall be conducted of the IMARS subsystem (JSC 37544) end item qualification reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the IMARS is able to return the utilization file products to the MBF in support of the Instrumentation Program and Command List process for use in creation of standard output products.

C. The IMARS capability to gather, store, and configuration manage MOD–unique data for use by MOD ground facilities and GFE projects to support ISS operations shall be verified by analysis. An analysis shall be conducted of the IMARS subsystem (JSC 37544) end item qualification reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the IMARS is able to gather, store, and configuration manage MOD–unique data for use by MOD ground facilities and GFE projects to support ISS operations.

F4.3.7.19.3.2 Perform Reconfiguration Product Generation

The IMARS capability to produce reconfiguration products and reports for use by the MOD operators, MOD ground facilities, and GFE projects shall be verified by analysis. An analysis shall be conducted of the IMARS subsystem (JSC 37544) end item qualification reports. The

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verification shall be considered successful when analysis of lower–level qualification data shows that the IMARS is able to produce reconfiguration products and reports for use by the MOD operators, MOD ground facilities, and GFE projects.

F4.3.7.19.3.3 Perform Configuration Control of IMARS Input and Output Products

The IMARS capability to provide a configuration–managed repository for storage and access control of input and output products, including onboard software, telemetry and command reconfiguration data, operations data, and ground facility–unique reconfiguration products shall be verified by analysis. An analysis shall be conducted of the IMARS subsystem (JSC 37544) end item qualification reports. The verification shall be considered successful when analysis of lower–level qualification data shows that the IMARS is able to provide a configuration–managed repository for storage and access control of input and output products, including onboard software, telemetry and command reconfiguration data, operations data, and ground facility–unique reconfiguration products.

F4.3.7.19.3.4 Perform Reconfiguration Product Distribution

The IMARS capability to provide for access and distribution of IMARS reconfiguration products, data, and reports to MOD ground facilities and projects shall be verified by analysis. An analysis shall be conducted of the IMARS subsystem (JSC 37544) end item qualification reports. The verification shall be considered successful when analysis of lower–level qualification data shows that IMARS is able to provide for access and distribution of IMARS reconfiguration products, data, and reports to MOD ground facilities and projects.

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F4.3.8 Precedence.

No verification required.

F5. PREPARATION FOR DELIVERY.

F5.1 General.

Preservation and packaging for USGS systems, components and spares shall be designed to sustain certified performance levels and reliability margins. Each USGS system shall ensure all equipment is properly preserved, packed, and marked for transportation (if transportation is required).

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